

SCHEDULED WASTE INVENTORY AND MONITORING  
SYSTEM

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SCHEDULED WASTE INVENTORY  
AND MONITRING SYSTEM

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JANUARY 2023

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## **ABSTRAK**

Dengan perkembangan pesat teknologi pada masa kini, syarikat perlu mula menggunakan sistem dalam talian untuk memudahkan mereka dan menjadikannya tersusun untuk mengendalikan maklumat syarikat dan dapat menyimpannya dengan selamat. Bagaimanapun, syarikat Flexsys Chemical (M) Sdn Bhd masih menyimpan rekod buangan terjadual secara manual. Proses ini boleh menjadi tidak sistematik dan menyebabkan pekerja berasa sulit ketika mengurus data mereka.

Justeru, pembangunan sistem Inventori dan Pemantauan Buangan Terjadual akan membuat perubahan kepada pekerja kerana ia akan menambah baik proses penyimpanan maklumat buangan terjadual dan pihak pengurus dapat memantau pelupusan buangan terjadual dari jauh. Itu adalah objektif untuk projek ini. Sistem ini akan menyediakan beberapa ciri yang dapat membantu pekerja dapat menyelesaikan kerja mereka dengan cara yang sangat cekap. Malah, sistem ini juga boleh digunakan oleh syarikat lain jika syarikat menggunakan kaedah yang sama untuk menyimpan dan memantau sisa mereka.

Sistem Inventori dan Pemantauan Buangan Terjadual akan dibangunkan dengan menggunakan Agile metodologi kerana mudah untuk membangunkan projek dan membuat sebarang perubahan mengikut keutamaan pelanggan jika ada ketika proses pembangunan. Sistem ini akan diuji oleh salah seorang pekerja dari Flexsys Chemical (M) Sdn Bhd untuk membuktikan bahawa sistem sudah memenuhi keperluan pengguna.



## **ABSTRACT**

With the rapid development of the technology nowadays, the company has to start using an online system in order to ease them and make it efficient to handle the company information and be able to store it safely. However, the Flexsys Chemical (M) Sdn Bhd is still keeping the record of scheduled waste manually. This process can be unsystematic and inconvenient for the staff to keep doing that.

Hence, the development of the Scheduled Waste Inventory and Monitoring system will make a change for the staff as it will improve the process of keeping the scheduled waste information and the manager is able to remotely monitor the disposal of scheduled waste. That was the objective of the project. The systems will provide few features that can help the staff to be able to complete their work in a very efficient way. In fact, the system also can be used by other companies if the company uses the same method to store and monitor their waste.

The Scheduled Waste Inventory and Monitoring system will be developed by using the agile methodology as it is easy to develop the project and make any changes according to the client preferences if any during the development process. The system will be tested by one of the staff from Flexsys Chemical (M) Sdn Bhd in order to prove that the system already meets the users' requirements.

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

Manufacturing industry has become one of components that is needed by modern society as the nation is being developed and to produce products for the people to use to carry out their daily activities. Most of the manufacturing industries will generate or produce an unavoidable waste that is caused by the developmental activities. End user products such as televisions, smartphones and also car's tyre can contain toxic chemicals that can pollute the environment. Chemicals are substances that need to be broken down into simpler parts by undergoing some reaction to change it into a new form that does not affect the human and environment. A chemical substance becomes a waste product when it is useless to that particular manufacturing industry. What is chemical waste? Chemical waste can be defined as a waste that consists of radioactive elements(Kabbashi et al., 2011). Chemical waste can be found in a few types of matter which are solid, liquid or gaseous. Solid chemical waste can be explained when the jumbo bag, drum or intermediate bulk container is used to store or come in contact with a chemical substance, meanwhile for liquid chemical waste examples are used oil, used grease and many more. Gaseous chemical waste can contain carbon dioxide, hydrogen sulphide, nitrogen and others. With that being said, inappropriate disposal of chemical waste may lead to harmful effects to the human and also to the environment.

In Malaysia, there are many factories that supply and produce products that benefit the people. One of them is Flexsys Chemical (M) Sdn Bhd that solely focuses on chemicals and solutions that improve the safety, longevity and performance of rubber products such as tyres. Hence, it will generate its own chemical waste during the process of making the chemical and solutions. The Department of Environment(DOE) in Malaysia, has introduced the Environmental Quality Act 1974



with the purpose to preserve the human environment's quality and to avoid and control the pollution, as well as to improve the environment. According to Environmental Quality (Scheduled Wastes) Regulations 2005, these regulations provide the disposal, treatment, management, storage and transport of the scheduled wastes. Scheduled wastes can be defined as any wastes that falls into one of the waste categories that has been listed in the First Schedule attached to these Regulations. Besides, 76 categories of 77 scheduled wastes was listed under these regulations. Based on those regulations, Flexsys Chemical (M) Sdn Bhd must follow to prevent them from being fined by the government and to preserve the environment. Since there are many scheduled wastes that need to be handled, it is efficient for the Flexsys Chemical (M) Sdn Bhd to have the scheduled wastes inventory system. The inventory system will keep track of the date of scheduled waste was being generated including the details of scheduled wastes such as expiry date, the type of waste, package, content and also the weight(MT). Apart from that, the system will alert by notifying the person in charge of the scheduled waste in the inventory system to dispose the waste on the date the waste should be disposed.

## 1.2 Problem Statement

In handling large and various types of chemical waste, there will be some problems that will arise by accident. For small factories that generate small amounts and less chemical waste, it is still relevant for them to keep track of the disposal of the waste manually. However, as for Flexsys Chemical (M) Sdn Bhd that is expected to keep growing as Malaysia is one of the developing countries. Keeping an information manually will lead to another problem such as lack of efficiency, incorrectly inserting the data and many more. Besides, the probability that the book of the record might be lost is high considering that the book will be anywhere and everywhere. One of the problems that may happen, the person in charge may forget the day of the scheduled waste should be disposed as when it is written manually, there will be no way the paper sheet will alert the person in charge. According to the regulations stated above, the scheduled waste should be disposed within 180 days and not more than that. If the scheduled waste is disposed belatedly, it will cause pollution to the environment and most things that factories want to avoid are being penalized. The penalty for an unlawful trafficking, the company may receive a fine of RM500,000.00 or five years' imprisonment that has been stated in EQA section 34B. The person in charge also may be punished by the company for ignoring their responsibilities. Consequently, by using this scheduled waste inventory system, this system will alert by notifying the person in charge of the scheduled waste regarding the time remaining to dispose the waste and alert the person a few days before the 180th day.

Other than that, the weight of the scheduled waste is also important to be recorded wisely. The total weight of the scheduled waste should not exceed 20 metric tonnes (MT). This regulation also implied to Flexsys Chemical (M). Each container or other packaging that is used to store the waste, should be clearly labelled with the date of scheduled waste generated, scheduled waste content, state, and also group. The mass balance of the scheduled waste also needs to be recorded to ensure the generated waste weight is the same as the initial weight. These details are very important for the disposal of scheduled waste processes. Since there are many details that need to be taken off, it is efficient to record all the details in the inventory of scheduled waste so that the person in charge would not miss the details to avoid unwanted events that may cause problems to the company and the person in charge itself. Considering Flexsys

Chemical (M) is a company that supplies chemicals and solutions to factories that produce tyre's rubber, the company also purchases chemical substances in order to produce the chemical and solution. By upgrading the manual process by automating the process of tracking the scheduled waste disposal will be very beneficial to the company.

### **1.3 Objective**

The objective of this project:

- I. To study the Scheduled Waste Inventory and Monitoring system
- II. To develop a web-based application which is Scheduled Waste Inventory and Monitoring system
- III. To evaluate the functionality of the Scheduled Waste Inventory and Monitoring system.

### **1.4 Scope**

The scope of the projects is listed below:

#### **1.4.1 Target User**

- Workers who are in charge of disposing scheduled waste
- Admin

#### **1.4.2 Development**

- The proposed system will be developed by using Laravel.
- The database of the proposed system using MySQL.
- Develop the function for the inventory such
  - i. Sign up and Login for users
  - ii. Alert and reminder for scheduled waste disposal
  - iii. Calendar for scheduled waste disposal
  - iv. Inserting inventory of the scheduled waste, transporter, receiver

## **1.5 Thesis Organization**

Chapter 1: This chapter will discuss the introduction of the web-based system which is an inventory of scheduled waste. The purpose of this chapter is to briefly explain about the system that is going to be developed. This chapter also provide the problem statement, objectives and including the scope of the study.

Chapter 2: This chapter provides information about Scheduled Waste Inventory and Monitoring system. It also provides comparison between three web-based existing application systems. This include the advantages and disadvantages for each system. Besides, this chapter will discuss on how the proposed system to be developed in better way based on the analysis made.

Chapter 3: This chapter will discuss on the methodology use to develop proposed system which is Scheduled Waste Inventory and Monitoring system. It also explains how each of the phase in the methodology are helping in develop the proposed system. All the project requirements such as hardware, software, functional and non-functional are listed in this chapter. User requirement also being included along with the constraints and limitation to develop the Scheduled Waste Inventory and Monitoring system.

Chapter 4: This chapter will discuss implementation of the Scheduled Waste Inventory and Monitoring system including the result. In this chapter, it provides the interfaces, User Acceptance Test and all the requirements including the hardware and software are used to develop the complete system.

Chapter 5: This chapter provide the conclusion of the three main objective that has been stated in chapter 1. Besides, it also discusses on the recommendation based on the feedback that has been retrieve after conduct a user acceptance testing and some limitation also being included. Few suggestion has been made such as implement barcode system and also record attendance using face recognition.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

With the high speed of technology development, a lot of work can be done faster and earlier. As for example, for the production industry. Most of the industry uses technology in order to enhance the quality of the business. They will retrieve so much information that is not limited to the raw materials, stocks, generated waste and many more. Therefore, the web-based online inventory and monitoring comes in hand. The system will ease the individual to control and receive the information. The system is needed for getting accurate and fast information. The use of the online inventory may have a significant impact on the company. For instance, it will accelerate the company's performance in generating the required information.

However, not all the existing inventory systems can fulfil all the user requirements. There are many categories for inventory for different companies such as inventory of chemical waste, lab tools, car accessories and more. Each of the companies need different features to match their product inventory to take advantage of the online inventory system. As a consequence, the literature review will provide the significant comparisons of the features between the three existing online inventory systems. This will comprise the pros and cons, language used and integration of the systems. Based on the analysis, DGAssistant Software, Quartz Software and Workshop Software are quite similar to the proposed inventory system.

## 2.2 Existing Systems/Works

### 2.2.1 DGAssistant Software

DGAssistant Software Is a web-based system that provides documentation and the management of chemical waste and dangerous goods with professionals. The software was built in collaboration with the University of Burgos by using breakthrough technology and meticulous methodologies(DGAssistant Software, 2022). This software does not need to be installed on the user end device; instead, users just need a web browser and stable internet connection. Besides, this software is always up-to-date according to the present-day. By looking at the main page after user login into the website, it shows all the menus on the left side.

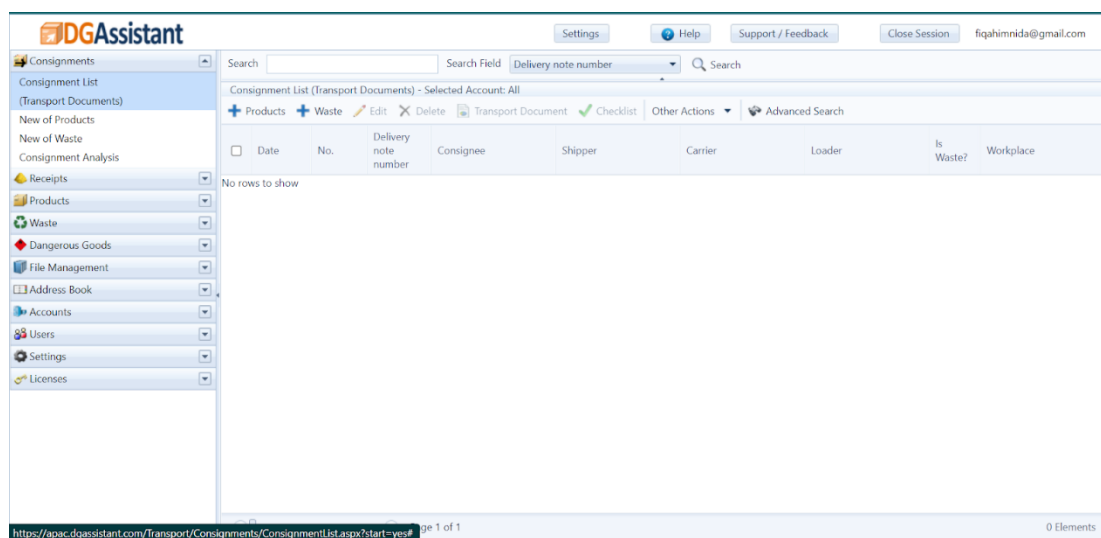


Figure 2.1 DGAssistant Main Page

The foundation of DGAssistant Software was to solve the problems of people who are in charge of chemical waste and dangerous goods management through highly reliable and simple-to-use software. Besides, the main objective of DGAssistant Software is to manage every single thing that is related to the transport of the dangerous goods and also chemical waste. Users just need to define waste, goods, shipper and also the carrier in the system. By doing so, the system will generate the shipments and receipts based on the database that has been filled by the user. Users can easily control the centres, goods and also scheduled waste in the company quickly. Moreover, this software offers several features such as management of the document, analysis of the data and exporting the data(DGAssistant Software, 2022).

## 2.2.2 Quartzzy Software

Quartzzy software is web-based software that works as inventory management of supply and lab-made material(Quartzzy Inc., 2022). The start-up of the Quartzzy company is in Hayward, California(LinkedIn, 2022). Quartzzy software is a cloud-based lab management platform thus, it is not required to be downloaded before using the system. With Quartzzy, if the current lab is using Microsoft Excel or Google Sheets as their database, the system allows to export it in Quartzzy cloud database. The system was built specifically for those who work in the laboratory line. It is a breakthrough platform that helps scientist's lives and lab managers to improve their materials day by day. This platform will provide the request and inventory of the materials as shown in figure 2.2.

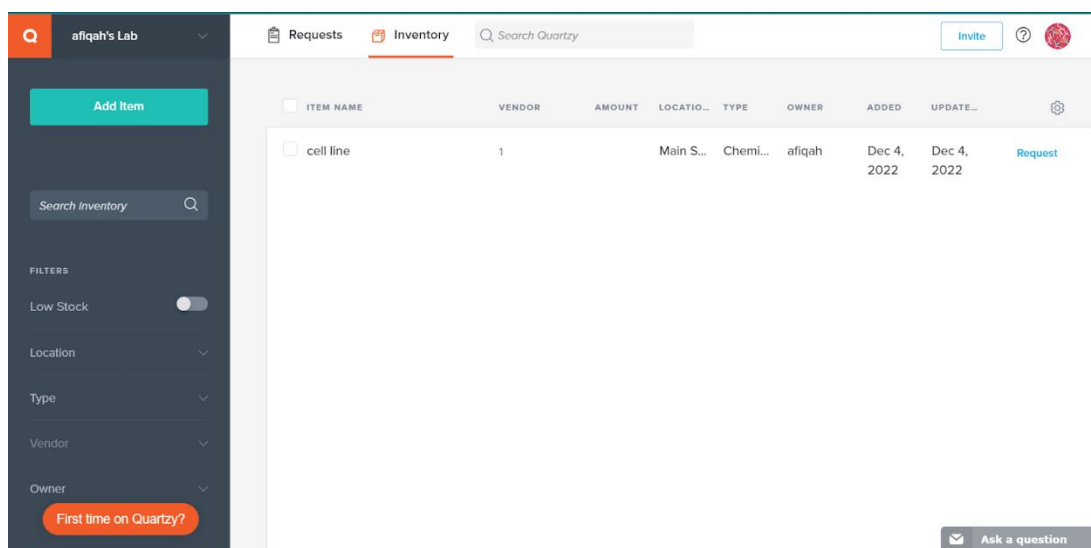


Figure 2.2 Quartzzy Main Page

The Quartzzy inventory will include the quantities, locations and the expired date of the substance will be provided in the system. When the stock is low, users can easily request for new just by clicking on the request button without the need to enter the information again. Besides, the system allows the users to make an order of substances or tools from another lab. Hence, it will simplify the communication between the labs, department level administrators such as the person who ordered, recorded and acquired essential lab goods. So that, the lab managers can approve and acknowledge the request all in one platform(Quartzzy Inc., 2022).

### 2.2.3 Workshop Software

Workshop software is a web-based and cloud-based application that has been developed for use in the automotive industry. Workshop system has been involved in the automotive industry starting in 1996 until 2020. It all began with Ron Mitchell and John Bendall who had the initial eyesight for Autosoft(Workshop Software, 2022). Workshop system is an online platform to manage a thorough workshop, garage or auto shop. To manage all the procedures and tasks in the automotive plant, will limit the time and resources to focus on repairing services and billable hours, thus it minimizes the company profit(Workshop Software, 2022). With the intelligent features in Workshop software, users can easily manage their business efficiently. Figure 2.3 shows the main page of the system.

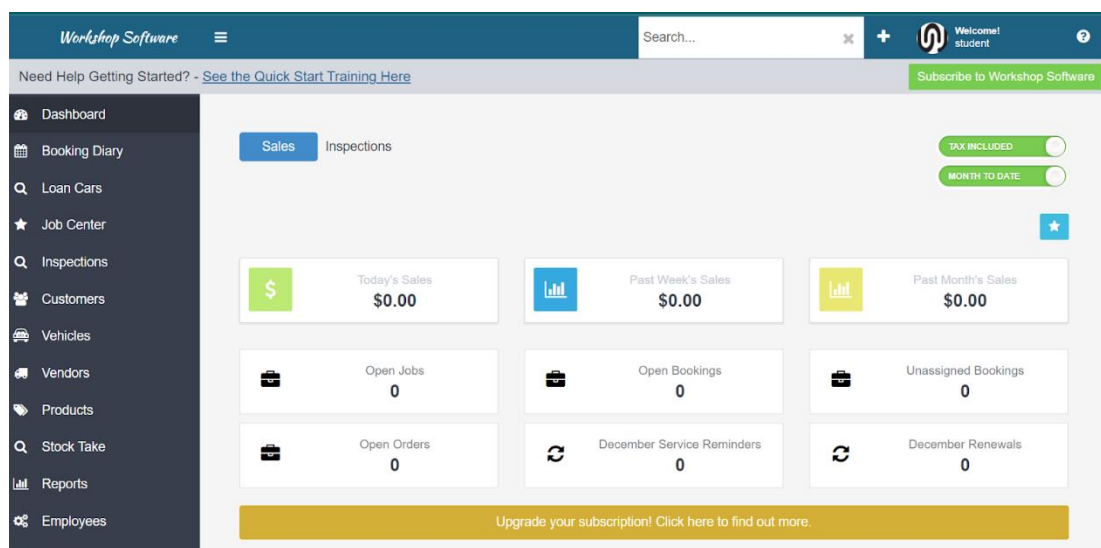


Figure 2.3 Workshop Main Page

The Workshop system was originally built for the individual who works with automotive lines. Users of the Workshop system can supervise their workshop's entire front end workflow. This including the booking, job management, quotation, invoicing, inspections and complete data of vehicle history was provided in the system. There are so many categories and types of car parts that cannot be memorized if it was listed out. In the service business, time is the most priority. Thus, the individual that charges in the automotive field's inventory, it is more convenient to use the Workshop system as it can easily track the products that have been purchased. All the details such as brand, type, price, quantity and many more will be stored online. Besides, the



Workshop system allows the user to make a fast invoice to the customer as all the details are being recorded until the service is completed. Therefore, there will be no miscalculation or late payment by the customer as users can contact the customer through the email in the Workshop system.

## **2.3 Comparison of Existing System**

The three existing systems are DGAssistant system, Quartz system and Workshop system that will be analysed and compared according to the used language, design, module, features and the integration used in the existing system. Table 2.1 shows the summarization of the comparison between the three existing systems including their pros and cons.

### **2.3.1 DGAssistant Software**

In developing the DGAssistant system, the developer uses a web framework which is Microsoft ASP.NET. The use of this framework allows the developer to develop dynamic web pages. The DGAssistant Software target user is a person who works in the management of chemical waste. Most often, these chemical waste can be found in factories that produce goods to people. In figure 2.4, it shows the main page of the system after successfully login. The design of the system can be categorized as a simple website but not an attractive one as it has very minimal colours and the menus can be easily seen on the left side of the system. Hence, the user does not need to explore more to find out the features.

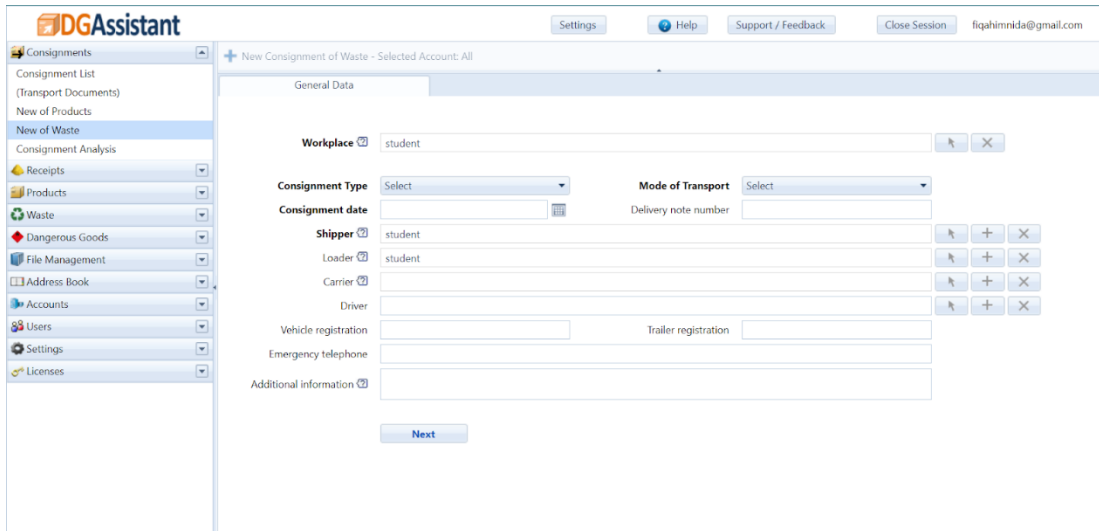


Figure 2.4 DGAssistant Main Page

However, one of the disadvantages is the few icons used in the system are not suitable to present the menus. The use of suitable icons in every system are very important to help the user navigate a system. For example, the icon for receipt and search icon in DGAssistant Software as shown in figure 2.5 and 2.6 is not suitable and does not represent the menus. The standard icons used for receipt and search are shown in figure 2.7 and 2.8.

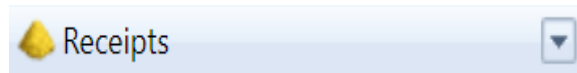


Figure 2.5 Receipt Menu

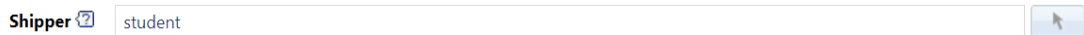


Figure 2.6 Shipper Name



Figure 2.7 Receipt Icon  
Figure 2.8 Search Icon

Another drawback of the DGAssistant software is that it does not have any special features such as messaging or alert notification. However, it has 4 modules that would be needed by the individual in charge of managing goods and waste. The first module of DGAssistant system is Consignments as shown in figure 2.9. This module will create documentation needed for the transportation of the dangerous waste either using a road or air. The user just needs to choose the waste from the database and specify the amount of the waste and in terms of the calculation, the system will calculate the amount of the waste. After that, the document can be exported to PDF or Excel.

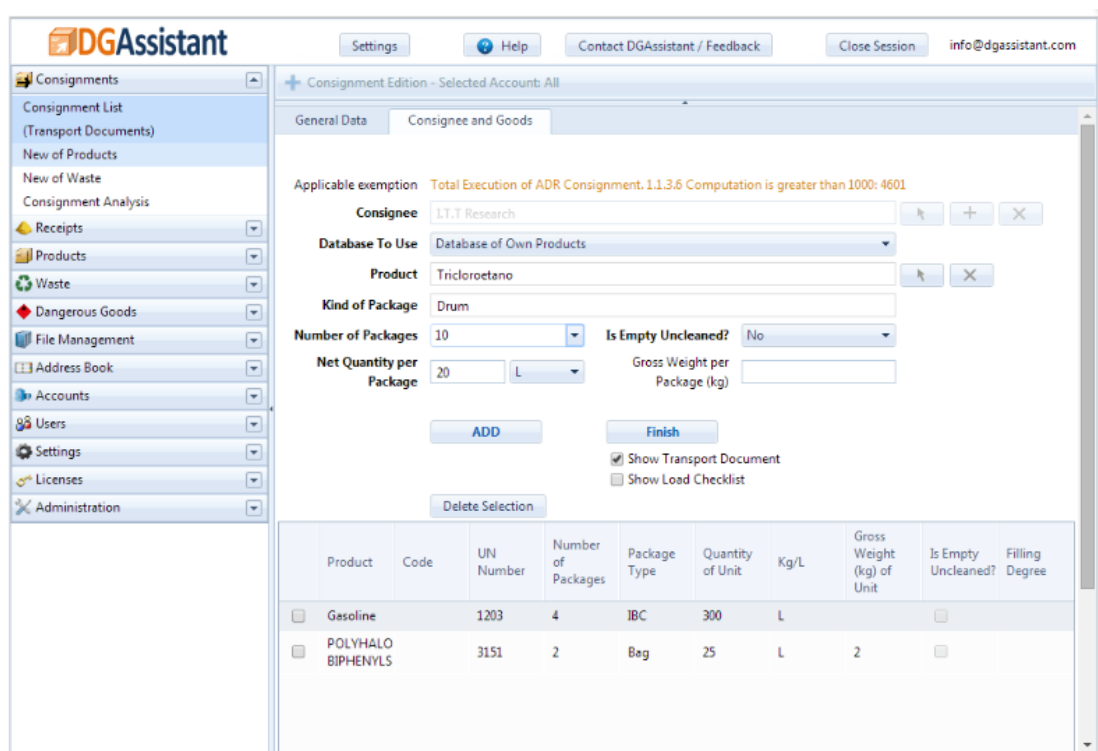


Figure 2.9 Consignment Module

The second and third module is Products and Waste. Both modules have the same information that needs to be filled in. When defining a dangerous good and waste, the user must fill in the data related to it such as waste type, type of container, name, weight and many more only once as shown in figure 2.10. Another feature that DGAssistant system provides is, users just need to enter the number of packaging that is being transported when receiving or dispatching the goods and waste. The system automatically will retrieve all the obligatory information from the database.

Waste Features

Account: student

Enable for IATA (Aircraft): Select      Enable for IMDG (Vessel): Select

Waste Type: Selecting Good      Is Empty Uncleaned?: No

Code:

Name:

Dangerous Good: Select

Environmentally Hazardous: Select      Pure, Mix or Solution: Pure

Physical State: Select      Measure Unit: Select

English Tech. Name:  +

Flash Point (°C c.c.):       Density (kg/L):

Next

Figure 2.10 Waste Page

In transporting the dangerous waste, another important thing to be taken is the shipper's information. This is because the dangerous waste must be disposed as it should follow the established law, otherwise the dangerous waste may pollute the environment. This takes us to the third module which is the Address Book. This module will contain all the shipper's information such as driver's name, vehicle registration, consignment type and more as in figure 2.11.

General Data

Workplace: student

Consignment Type: Select      Mode of Transport: Select

Consignment date:

Delivery note number:

Shipper:  + -

Loader: student      + -

Carrier:  + -

Driver:  + -

Vehicle registration:       Trailer registration:

Emergency telephone:

Additional information:

Next

Figure 2.11 Shipper Form

Apart from that, DGAssistant system also integrates with the REST API portal(DGAssistant Software, 2022) as shown in figure 2.12. Rest API or also known as RESTful API is an architecture that specially for an interface of the application program that uses HTTP to retrieve and use data(Mason & E-series, n.d.). GET, PUT,

POST and DELETE are the data types used by retrieved data that refer to read, update, create and delete. This explained how the DGAssistant system generated the documentation for transportation, receipt and more.

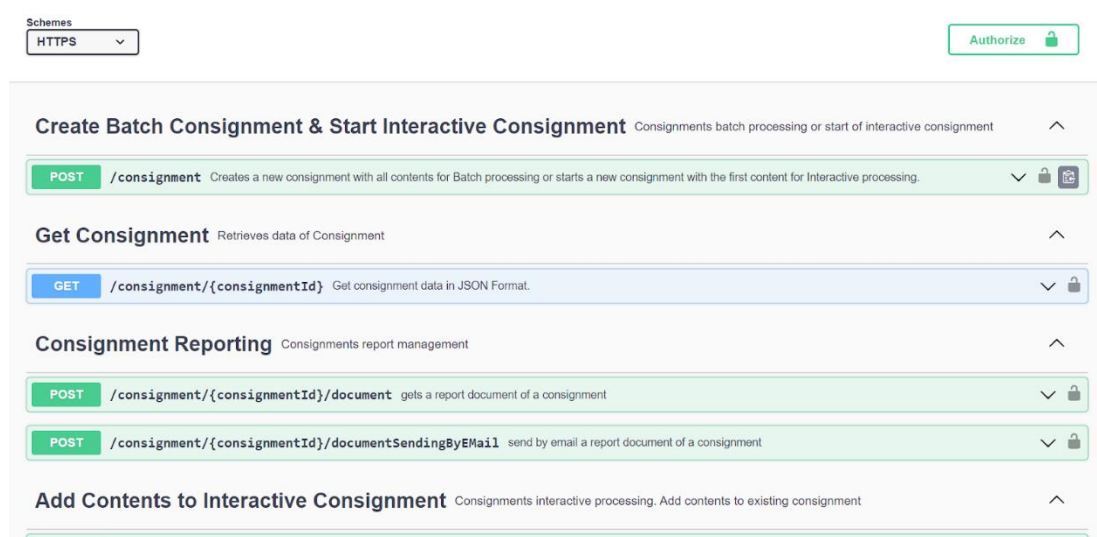


Figure 2.12 REST API

### 2.3.2 Quartzzy Software

The Quartzzy system is developed by using JavaScript web Framework which is Ember.js that uses HTML and CSS as the primary elements to develop the web page(Point, 2015). By the use of Ember.js, it allows the developer to create a single-page web application (SPA). This will allow the user to interact with the webpage dynamically by rewriting the present web page with the newly inserted data by the user from the web server(Tilde Inc., 2022). Therefore, users do not need to refresh every single time after filling in the data and this will lead to faster conversion and the website much more like a native application.

Apart from that, the interface of the Quartzzy system is very simple and attractive. The system is intuitive and also consistent. For example, the request and inventory page using the same design and very easy to navigate. Each function and features of the system are neatly organized and engaging with the user. The Quartzzy system also used the common icon and language.

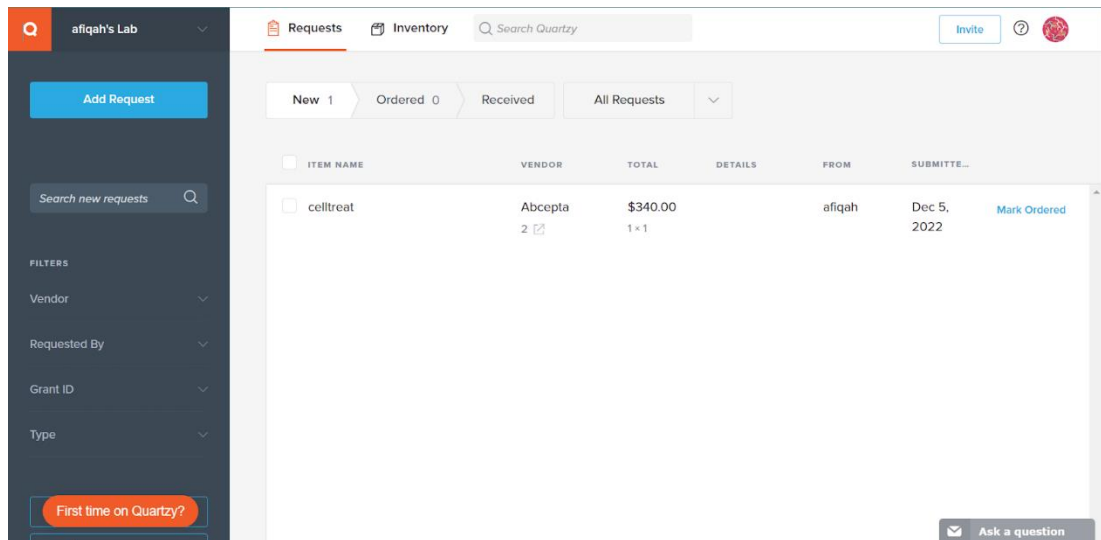


Figure 2.13 Quartzzy Main Page

The Quartzzy system has a few features that can help the user to get better experience during the use of the system such as the live chat, add lab member, search and filtered the inventory with low stock items. As the Quartzzy system integrates with the suppliers of material related to the laboratory, the system provides the live chat features. This live chat is used if the user has any problem with the request order made by them. Users just need to enter the name and ordered number, then the system will forward the message to suppliers.

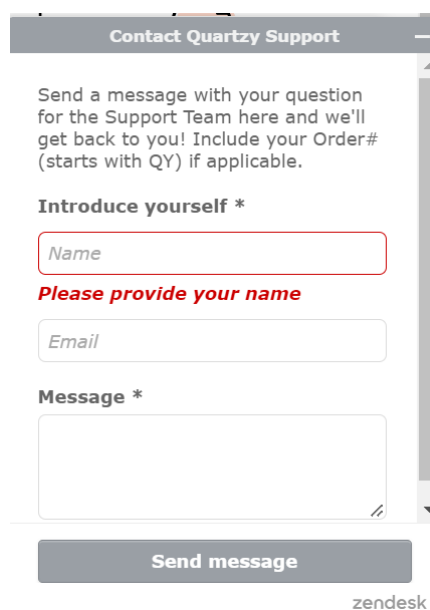


Figure 2.14 Live Chat

Since there is more than one person who works in the laboratory, the Quartz system has the features where the user is able to invite another lab member through the system. There is no need to add members via the copied link and through WhatsApp application. Hence, all the lab members can monitor the stock of the tools or substances and make any request if they are low on stock without depending on one person only. Lab manager also can administer the request made and inventory made by the fellow lab members.

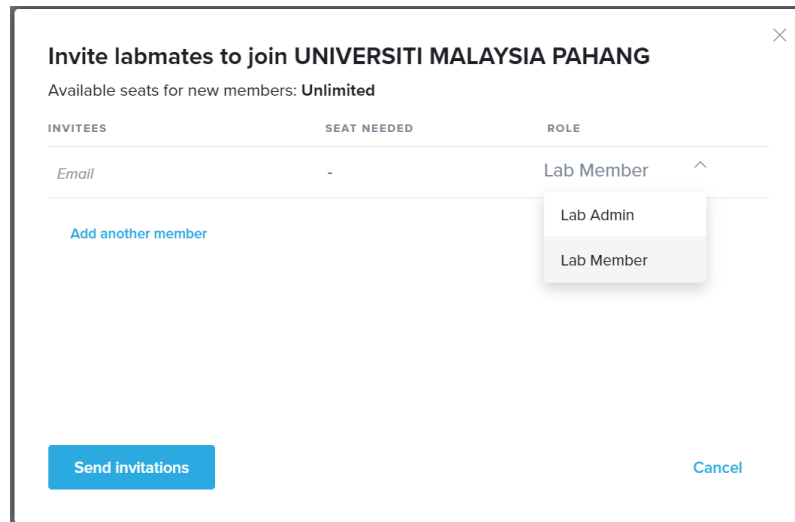


Figure 2.15 Invite Lab Member

As Quartz system is just a platform to request some tools or substance and store it as online inventory management, there are only two modules present in the system which are Requests and Inventory. In the first module which is Request, it will allow the user (Lab Member) to order any tools' lab or substance needed from the chosen vendor by the user itself. If the supplies need to be received urgently, the system offers a feature where users are able to click on urgent and choose the date needed to receive the supply. Moreover, Quartz stores all the laboratory's order history and users are able to make the same request if low in stock with on click without need to hunt product description or catalog number again. Also, Quartz has filters features where users can filter the made request by Vendor, Requested By, Grand ID or Type.

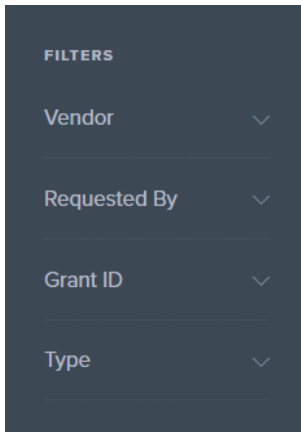


Figure 2.16 Filtering Request

**Add your request** [← Back to Lookup](#)

\* Vendor  \* Catalog #

\* Item Name

URL

Unit Size	Qty		Unit Price	Total
<input type="text"/>	1	×	<input type="text"/>	<b>\$0.00</b>

**Add request details**

Requested by afiqah  Urgent

Type  Grant ID

Requisition #  PO #

Notes

[Upload File](#) or drag and drop files onto this area to upload them

Figure 2.17 Request Form



→

**cell line**

Requested by afiqah

[Mark Ordered](#)

[Request Again](#) [More](#) ▾

**Request**

\* Vendor  
Abnova

\* Catalog #  
01

Unit Size	Qty
2	15

Request  
Comments  
Order Details  
Vendor  
History

Figure 2.18 Request Summary

The second module which is Inventory. This module will extract the information from the request and also be stored in the Inventory module. The user also is able to add the item to the inventory form but with more details. This includes where the item will be stored, the specification of the items such as expiration date, reminder and many more. Other than that, if there are so many things in the laboratory's inventory, it is difficult to memorize the item number or item name. To ease the lab member in finding the item, Quartzzy system provides the barcodes print for each item. Hence, the lab member just needs to scan on the item and it will redirect to the item stock in Quartzzy system.

Vendor

Catalog #

\* Item Name

Price

Unit Size

Amount In Stock

URL

[Upload File](#) or drag and drop files onto this area to upload them

**Type**

Type  
General Supply

**Location**

Figure 2.19 Add Item Inventory

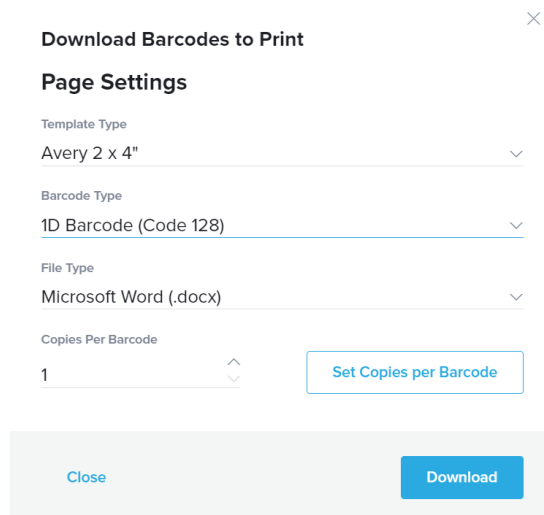


Figure 2.20 Barcode Print

Besides, Quarry system inventory allows the users to set the minimum and maximum levels of the stock as shown in figure 2.21. Thus, when stock is running out, the system will filter display Low Stock status on the item. To do so, the Low Stock toggle button on the left must be enabled.



Figure 2.21 Setting Minimum and Maximum Stock Level

In addition, the Quartzzy system has integrated with Stripe.com in order to securely process all of the transactions from the customer's credit card(Tilde Inc., 2022) from the Quartzzy system. Apart from that, Quartzzy system also integrated with AWS(Tilde Inc., 2022). This is to ensure the data in Quartzzy systems is more flexible and secure the use of cloud computing.

### 2.3.3 Workshop Software

In developing the Workshop system, the developer uses Zone.js for the JavaScript Framework. Workshop system is categorized as a dynamic webpage because the features such as present day's sales, past month's sales, booking and more

will change every day depending on the user input and also update. Besides, the design of the interface is simple and attractive. Even though there is not much color used because the color used is bold enough to attract the user's eyes. For each module and features, it has appropriate and suitable icons used. The user will not have any problem while using the system.

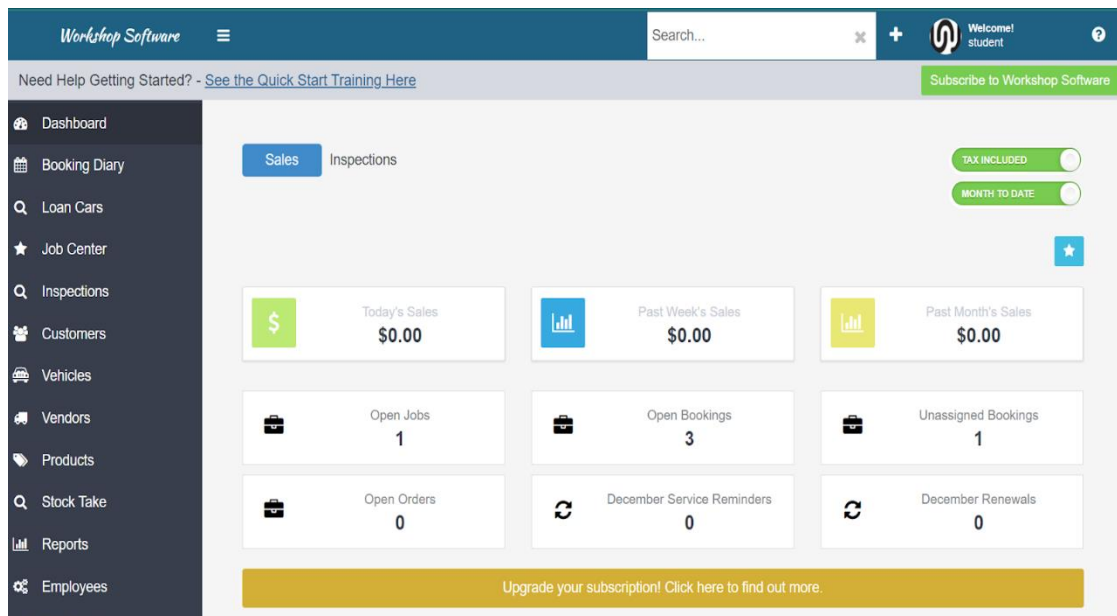


Figure 2.22 Workshop Main Page

In addition, as shown in figure 2.22, the Dashboard of the system is occupied with the information. However, the information displayed is organized and pleasantly presentable to the users. Users will not feel interrupted with the present information.

The Workshop system has so many features and modules that are relevant to the title itself. One of the features and advantages in the Workshop system that ease the users is contacting the customers by email or phone number through the system. For example, users just need to click on the Email icon to contact through email or click on Message icon on the right side to contact through phone number. This is shown in figure 2.23.





























































Customer	Cell	Phone Number	
Aaron Hall	(045) 677-5564	(029) 956-7646	     
Benjamin Todd	(045) 011-6724	(029) 864-6754	     
Bob Smith	(045) 011-2076	(029) 987-5563	     
Cash Sale			     
Daniel Webster	(041) 363-3553	(025) 363-4645	     
Eugene McDonald	(045) 125-5635	(029) 859-3955	     
Franks Auto	(045) 128-5353	(028) 567-6465	     
Garry Brown	(045) 123-5534		     
hannah montanna		(120) 847-2823	     
Ned Powell	(045) 125-6745		     

Figure 2.23 Customers Information

A Aaron Hall

**Cell** required

**Message**

[+ Add Template](#)


Cancel
Send











Figure 2.24 Messaging Customer

**Email Address** required

**Subject**

**Message**

H1 H2 H3 H4 H5 H6 P pre 

**B I U**          

Please go to [Settings][Company Lists] and choose or create the appropriate template

[+ Add Template](#)

Cancel
Send

Figure 2.25 Emailing Customer

Booking diary is another example feature in the Workshop system. Booking Diary is just like a calendar. For instance, if the user has appointed a date to a customer, the system will automatically update the calendar and the Open Booking information at the Dashboard. After that, users need to appoint a mechanic to complete the booking in the Booking Diary module.

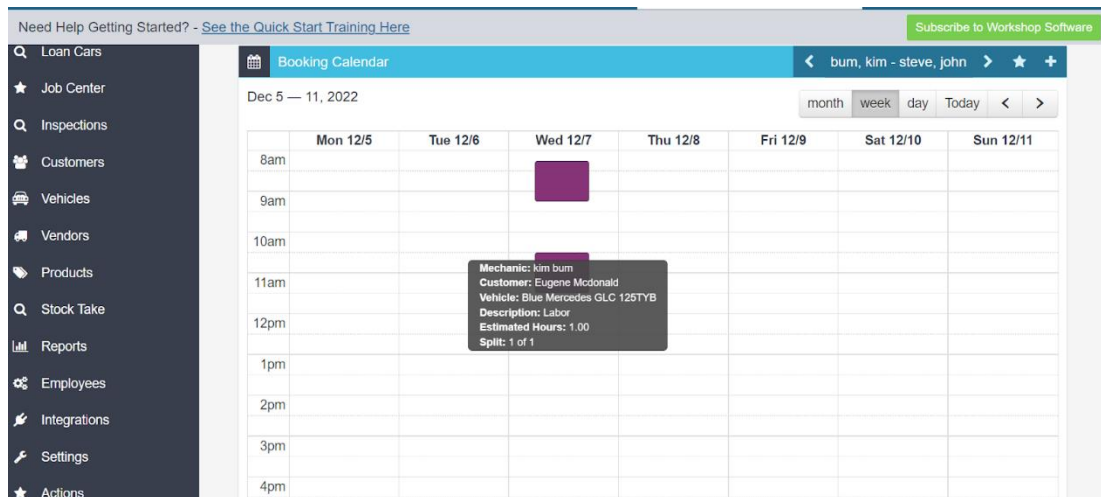


Figure 2.26 Booking Diary

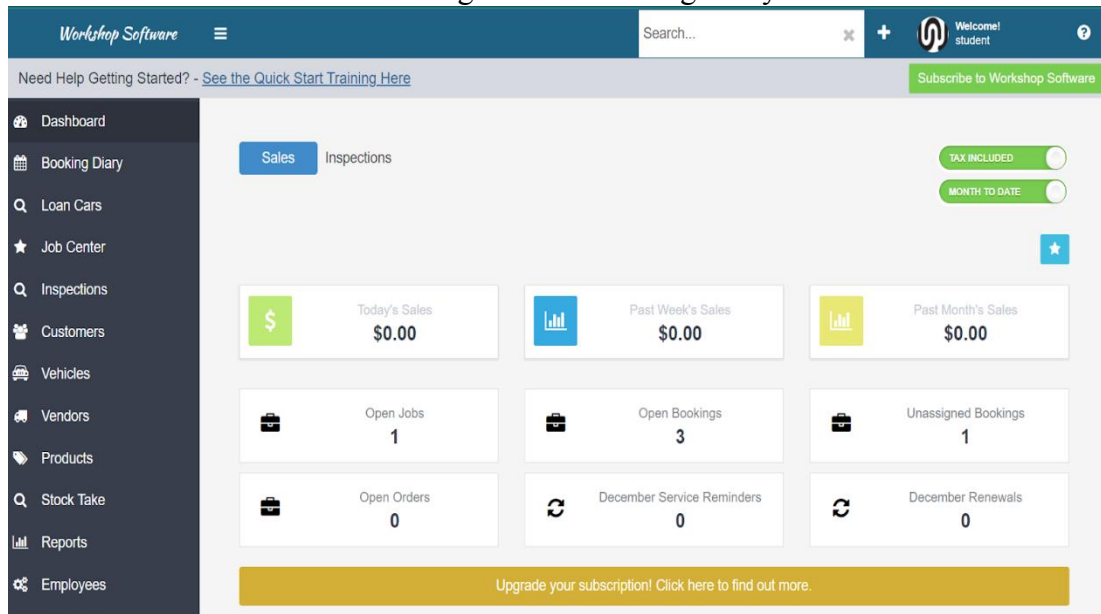


Figure 2.27 Updated Dashboard

In total, there are 12 modules present in the Workshop system which are Loan Cars, Job Center, Inspection, Customers, Vehicles, Vendors, Products, Stock Take, Reports, Employee, Setting and Actions. However, there are only five modules that

are important and need to be highlighted. The first module is the Dashboard. This module will present the real-time information after users have updated all the booking, payment, sales and many more. For example, if the users click on Open Booking modules as can be seen in figure 2.27, it will show the summary event of the booking dates as shown in figure 2.28.

Event Date	Customer	Vehicle	Job
Dec 6, 2022	hannah montan...		
Dec 7, 2022	Aaron Hall	YUI841 Mazda 6	
Dec 7, 2022	Eugene Mcdon...	125TYB Merce...	

10 records | First Page | ← | 1 | → | Last Page

Figure 2.28 Booking Summary

The second module is the Customer module. In this Customers module, all the details of the customers are being filled in in the form as in figure 2.29. By filling in all the details, it will help the users to find the customers easily. Moreover, this module eases the users to contact, create invoice and book a date for the customers as all the information has been recorded. Users just need to click on the icon beside the customer's name to choose what to do as in figure 2.23.

Customer Details: Account Balance: Unapplied Credit: [icon]

CASH [checked] INDIVIDUAL NON-BILLER

First Name required Last Name required Biller  
 Street Address 1 Street Address 2  
 Street Suburb Street State Zip Code  
 Postal Address 1 Postal Address 2  
 Postal City Postal State Zip Code  
 Phone Cell Fax  
 Email Web Preferred Method Of Contact

Figure 2.29 Customer Details Form

The third module is the Vehicles module. The function of this module is just the same as the Customer module where users need to fill in the form. Nonetheless, this module is specific on the car information of the customer's. After users save all the information of the vehicles, the system will display all the list of the vehicles in this Vehicles module as shown in figure 2.30. Besides, users are able to edit all the filled information, booking a date to repair and create an invoice easily as the system will retrieve all the inserted data earlier without the need of users to fill in the information again.

Figure 2.30 Vehicle Details Form

License Plate	Make	Model	Customer Name
125TYB	Mercedes	GLC	Eugene McDonald
567YTB	Holden	Commodore	Franks Auto
67HB5S	Hyundai	Getz	Daniel Webster
ABC123	Test	Test	Sample Customer - Edit me
ABC123	Mazda	3	Bob Smith
AHI764	Holden	Colorado	Garry Brown
BEE64M	Toyota	Corolla	Ned Powell
CA20987	2022	mazda	baek in hyuk

Figure 2.31 Vehicle list

The Products module is the fourth module that needs to be highlighted in the Workshop system. This module enables the users to store all the car accessories and

parts information needed to be sold to the customers as in figure 2.32. Moreover, this module allows the user to keep monitor all the quantity of each car accessory and part if the stock is low. This module lacks one feature where the alert notification of inventory fluctuations to the users. With the alert function, it will allow the users to improve the performance and profit of the company.

Item Code	Description	Brand	Retail Price	Cost	Qty
BK01	Brake Pads Remo...		\$23.00	\$34.00	
BRAKE			\$13.00	\$34.00	21.0
LAB	Labor		\$0.00	\$0.00	
NPN01	Environmental Co...		\$0.00	\$0.00	
NPN02	General Consuma...		\$0.00	\$0.00	
NPN03	Miscellaneous Par...		\$0.00	\$0.00	
NPN04	Loan Car		\$0.00	\$0.00	
OIL	OIL (EXAMPLE)		\$0.00	\$0.00	

Figure 2.32 Product Inventory

**BK01 Brake Pads Remove and Replace**

Item Code: BK01 (required)

Description: Brake Pads Remove and Replace

Retail Price: \$ 23

Cost (Excl. Tax): \$ 34

Cost (Incl. Tax): \$ 37.40

Default Labor Qty: 34.0

Service:  NO  YES

GST Free:  NO  YES

Figure 2.33 Product Inventory Details

In the Settings module, there are 11 sub-modules but in most of the sub-modules only one needs to be highlighted which is Reminders. The users are able to turn on or turn off the automatic send reminders to the customers as in figure 2.34. If the users turn on this reminder, the customer will receive a reminder from the Workshop system based on their preferred method of contact during filling out the



customer's information. The reminder will be sent a few days depending on the customer preferences too before the actual date of the booked appointment.

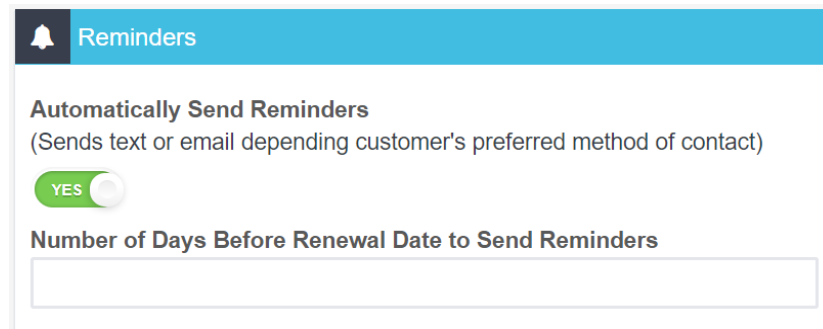


Figure 2.34 Reminders

Apart from that, the Workshop system has integrated with few other systems. The Workshop system integrates with PartsTech where it is a supercharged auto part search engine which allows the Workshop system to find and order car parts from the local vendor. Furthermore, the Workshop system integrates with CARFAX service shop. CARFAX is an American company that hands over vehicle data to businesses. The best product of the CARFAX is the CARFAX Vehicle History Report. Other than that, it also provides vehicle listing, buying and maintenance of the car. This explained how the Workshop system features of viewing the vehicle history as shown in figure 2.35 with just entering the vehicle's license plate number.



Figure 2.35 Vehicle History.

### 2.3.4 Analysis of existing system comparison

Element	DGAssistant System	Quartz System	Workshop System
Web application categories	✓ Dynamic web-based system	✓ Dynamic web-based system	✓ Dynamic web-based system

Target User	✓ Safety Advisor	✓ Lab Workers	✓ Workshop employee
Design	✓ Simple ✓ Unattractive ✓ Consistent	✓ Simple ✓ Attractive ✓ Consistent	✓ Simple ✓ Attractive ✓ Consistent ✓ Easy to understand
Features	✓ Search item ✓ Generate document ✓ Report Analysis	✓ Message ✓ Invite lab members ✓ Search chemicals ✓ Filtering ✓ Urgent request	✓ Message ✓ Search item ✓ Calendar ✓ Reminder ✓ Add employee
Module	✓ Consignment ✓ Products ✓ Waste ✓ Address Book	✓ Request ✓ Inventory ✓ Export and Import Inventory ✓ Low Stock	✓ Dashboard ✓ Booking Diary ✓ Loan Cars ✓ Job Center ✓ Inspections ✓ Customers ✓ Vehicles ✓ Vendors ✓ Products ✓ Stock Take ✓ Report ✓ Employees ✓ Reminders ✓ Create invoice
Integration System	✓ REST API ✓ LinkedIn ✓ Facebook ✓ ERP	✓ Stripe.com ✓ Facebook ✓ Twitter ✓ QuickBooks Online ✓ NetSuite	✓ CARFAX ✓ PartsTech ✓ Mitchell1 ✓ TIREMETRIX ✓ Xero ✓ Quickbooks ✓ wGarage
Method	✓ Microsoft ASP.NET	✓ Ember.js	✓ Zone.js
Advantages	1. Allow users to generate auto transportation document 2. The system include all the requirement modules on managing	1. Allow the users to set the stock levels for the minimum and maximum stock. If low stock, it will show reminder at the item name.	1. Ease the users to analysis the currents sales, booking, inventory as it shows at the dashboard of the system 2. The system have booking calendar which make the users easier to

	the dangerous goods and waste.	2. Ease the users to find item by filtering according to user preferences 3. Allow users to find item by using unique barcode print	trace the booking and the person in charge for specific customer 3. The system will sends the reminder to the customer few days before the customer's appointment
Disadvantages	1. Does not use standard icon 2. Do not have alert notification to send to the user 3. Does not have medium to contact the shipper such as messaging	1. Users may have difficulties to find the edit button since the system does not provide it. Instead users need to click on the item name to change details. 2. The search engine of the system is not convenient to the users as the users need to find the full name of the chemical in order to find the right chemical.	1. The system does not send reminder or alert notification if stock levels of the inventory are running low. 2. The system also does not provide users to fill in the date of the inbound and outbound of the inventory items

Table 2.1 Comparison Three Existing System and Pros and Cons

## 2.4 Relevance of Comparison with Project Title

### 2.4.1 Comparison between existing system and project title

#### 1. DGAssistant system

The advantages of the DGAssistant are it has all the features and crucial information that need to be filled and concerned during the receiving and transporting of the dangerous goods and waste. Hence the users are able to use the system efficiently. This includes the type of waste, packaging, weight of the waste and many more. In transporting dangerous goods and waste, the crucial part is the documentation. Dangerous goods can be transported by road and by air. Both methods of transportation need the document such as Transport of Dangerous Goods by Road (ADR) and International Civil Aviation Organization (IATA). Basically, the

DGAssistant system will generate the documentation and can be printed out after the user has been filling out the information needed in the system. User does not need to fill in the document manually again. Therefore, it will ease the individual to prepare the transportation of the dangerous goods to be disposed. Besides, in DGAssistant system, there are a few lists of dangerous goods and states the dangerous goods can be transported with which kind of transportation.

However, the DGAssistant system also has its own disadvantages. The system was lacking in terms of alert notification. When it comes to handling the dangerous goods and waste, it is important to know the expiring date of it. If the dangerous goods and waste are not being dispose on the date it should, the substance could cause pollution to the environment. Besides, it also can give a negative impact to the company such as being fined by the authority. Other than that, the DGAssistant system has a confusing design. The icon used for certain features does not reflect the features itself. Furthermore, DGAssistant system does not have the indicator for the required field user input. Even though the system shows the validation error, it still slows down the process of the users to complete their tasks. Aside from that, DGAssistant system also does not have the features for purchasing the dangerous goods for the productions.

Therefore, the Scheduled Waste Inventory and Monitoring system will implement the alert notification for the user to remind to dispose of the scheduled waste a week before it should. This will prevent an inevitable incident towards the company reputation. The proposed system also will be updated if the scheduled waste has been dispose. The design of the Scheduled Waste Inventory and Monitoring system must be user-friendly. To achieve the goals, the proposed system will be designed by using common metaphor and simple yet minimalist.

## **2. Quartz system**

The upper hand of Quartz systems is it is easier and user-friendly system. The design of the system is very intuitive and consistent. All the languages used are very simple and common. All the features in the system are neatly organized. Apart from that, the Quartz system enables the users to fill in the date of expiry for the substance. This function is needed so that the expired substance is being disposed and not used

as it can give an effect to the results. Besides, in the Quartzzy system, there is a function of setting the minimum and maximum levels of stock for inventory items. This is where users need to define the minimum and maximum of the stocks that are needed by the lab. This function can be really helpful for the users to monitor all the stock so that when the item is needed, there is no problem occurred.

The downside of the Quartzzy system is to edit the filled in request form and inventory field. The user may not find where to make changes (editing) since the Quartzzy system does not imply the edit button. To edit the information, users must click specifically on the Item Name not the column itself, and users will be able to make changes on the right side. Moreover, the cons of Quartzzy system, is the search function. When the users search for chemicals that have two words such as hydrochloric acid, and users just type in acid, it only shows chemicals that begin 'acid' not the substance with acid elsewhere in the name. It is quite inconvenient to the user as it is very difficult to memorize specific names of chemicals.

Thus, the Scheduled Waste Inventory and Monitoring system will make it easy for the user to navigate the features. For example, the user does not need to spend much time in finding the editing function, generate report and more. Users will find those buttons and functions just right beside the item name. Hence, it can be more user-friendly for the users. In addition, the search function of the proposed system will enable the users to find anything that comes with more than one word just by entering the memorized keyword by users and the system will list down all the chemicals or tools that have the keyword, not just the beginning of it.

### **3. Workshop system**

The pros of the Workshop system are it is a dynamic webpage as all the data will be updated to the dashboard in real-time. The design used in the system is very attractive and minimalist. Even though there are many features, it does not confuse the users. Besides, the calendar function in the Workshop system is very helpful to the users. Users do not need to find the customer's details to search when is the booking date for that specific customer. Every booking of the customers will be shown in the calendar. Also, it shows the specific employee that is assigned to the specific customer's booking so that will ensure the customer's car has its own mechanic.

Nonetheless, the system will send the reminders to the customer with their preferred method of contact a few days before the appointment date. So that the customer would not miss the appointment. The inventory of the products in the Workshop system are very simple yet complete.

However, the cons of the Workshop system are the system does not alert the levels of stock to the users. The problem will arise if the company needs the product but it is not there. This will have a negative impact on the company and their profit too. In the Workshop system there are so many features that will confuse the users and need user manuals to explore all the features even though not all users need those features. Besides, there are no dates to be filled in during filling out the products inventory form. Dates are really important in the inventory system because this will indicate the product's durability. This is because not all products have the same lifetime as some might have expired earlier.

Therefore, the proposed system which is the Scheduled Waste Inventory and Monitoring system will implement the alert notification for the user to remind to dispose of the scheduled waste a week before it should. Apart from that, the system also will enable the users to fill in the date of receive and transport of the waste. This will allow the users to monitor the scheduled waste. In addition, the development of the Scheduled Waste Inventory and Monitoring system will be based only on client requirements that are important and useful for them to prevent the overwhelming during using the system.

## **2.5 Summary**

In a nutshell, the comparison between the three existing systems are capable of enhancing the features and designs of the Scheduled Waste Inventory and Monitoring system. The Scheduled Waste Inventory and Monitoring system will implement a simple and clean design for the users to use. Users are able to use the system without the guidance of the user manual. Besides, the system uses the common language to easily interact with the users. The proposed system is able to manage the inventory of the scheduled waste from the beginning of the process until the end in an efficient way. This is because the proposed system is able to store all the scheduled waste important's

information such as type of scheduled waste, type of packaging, disposal site and many more competently. For example, in storing the scheduled waste, the total weight must be not more than 10MT if not the input field will be red in color that indicates weight is more than what is allowed. Besides, users can easily edit or delete the information as they want without any difficult circumstance.

Apart from that, the proposed system has implemented the alert notification to the users. For instance, if the scheduled waste is being stored for more than 180 days, it will alert the users by using a email. The system also allows the user to send the reminder to the individual in charge a few days before the date that scheduled waste should be disposed. If it is stored more than certain days, it will also alert the individual in charge. In addition, the Scheduled Waste Inventory and Monitoring system will have a calendar that specifically pin the date of scheduled waste that needs to be disposed and the person in charge.





## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Introduction**

To develop a system, methodology is needed to be used in order to develop an efficient system within the budget and time constraint. This chapter will be focused on the methodology that will be implemented during the development of the proposed system which is the Scheduled Waste Inventory and Monitoring system. Software development model, project management framework, project/user requirement, proposed design, data design, proof of initial concept, testing plan and potential use of proposed solution will be covered in this chapter.

#### **3.2 Project Management Framework/Methodology**

Methodology is one of the decisive steps in developing a system. To curtail the surprises during the development, applying a methodology is the right thing to do. The development process can be presented in planning, designing, development process, testing and also implementation. There are many types of methodology available to develop systems. However, to choose a methodology it depends on how the developer or the team members' work's process to deliver the project to the client. Using the right methodology will promote efficiency of the developing system. As for the proposed system which is the Scheduled Waste Inventory and Monitoring, methodology that is going to be used is Rapid Application Development (RAD) as it is designed to encounter the rigidity of others traditional model(Kissflow Inc., 2022). The process of the RAD is as shown in figure 3.1.

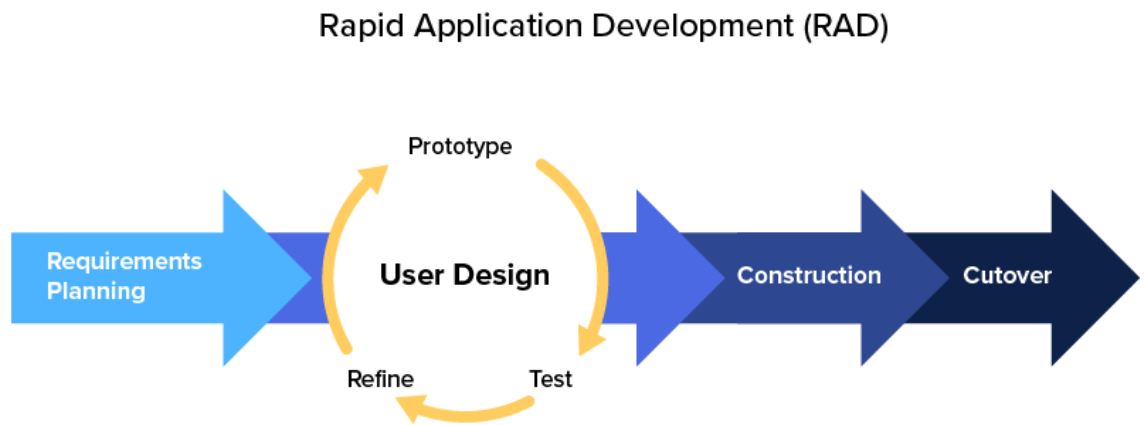


Figure 3.1 Rapid Application Development Methodology

RAD is a most used methodology currently because of the faster delivery of the project. As technology grows exponentially, companies cannot wait for any longer to implement or use the system. If they wait longer to use the system, they might miss the other good things. Rapid Application Development (RAD) is a methodology that solely targeted on rapid development through constant iteration and regular feedback from the client. RAD is designed to be flexible to the changes made by the client as it is common for the client to change their mind each time the team delivered the process of the project. Besides, RAD is ready to accept the new inputs such as features and functions in each step of the development process. Below are the explanations of each process according to RAD in developing the proposed system.

### **3.2.1 Requirement Planning Phase**

During this phase, developers, team members and clients must communicate to each other to emphasize the goals and expectations for the proposed project. This includes the discussion of current and potential issues that might be addressed during the development process. To develop Scheduled Waste Inventory and Monitoring system, the tasks are being performed during this phase are:

- i. Conducted meetings with supervisor and staff from Flexsys Chemical (M) Sdn Bhd
- ii. Discuss and agree with the background study of the project

- iii. Identified problem and the top solution is chosen, including the objectives and scope of the project.
- iv. Define system requirements for Scheduled Waste Inventory and Monitoring system
- v. Conducted an interview with the client to get user requirements from staff of Flexsys Chemical (M) Sdn Bhd

### **3.2.2 User Design Phase**

In this phase, it will describe the details of specification for the whole project for Scheduled Waste Inventory and Monitoring. Technically, users from Flexsys company are working with the developers and team to develop on or more prototypes that meet the users' system requirement. This can be said as customizable software development because users are able to test every prototype of the products in each stage to make sure it meets the expectations until the final product is completed. Rapidly built prototypes will encourage the involvement of the users, testing and feedback rather than attempt to do theoretical evaluation of the design(Kissflow Inc., 2022). This process and step are repeated regularly as the project evolves. The tasks performed during this phase are:

- i. Design use case diagram
- ii. Create flowchart
- iii. Create database
- iv. Design context diagram
- v. Design user interface by using adobe XD

### **3.2.3 Construction Phase**

During this phase, it is the continuous phase and works with user input. It takes the prototypes from the previous phase and changes the prototypes into the working model through coding. As the problems and changes were discussed during the rigorous iterative process design phase, developers can start to construct the final working model fastly. The tasks performed during this phase are:

- i. Implementing coding using PHP

- ii. Test and run the system

### 3.2.4 Cutover Phase

The Scheduled Waste Inventory and Monitoring will undergo testing, data conversion and user training (User Acceptance Test) stage once the system is eventually approved. All the functionality of the system must work according to the client from the Flexsys Chemical (M) company. Once the system is appropriately assessed, it is ready to be delivered to the Flexsys Chemical (M) company.

### 3.3 Project Requirement

The software and hardware requirements for developing Scheduled Waste Inventory and Monitoring system are being shown in table 3.3.1 and 3.3.2 below.

#### 3.3.1 Software Requirement

Software	Purpose
Microsoft Word	<ul style="list-style-type: none"> <li>• To write documentation for the system</li> </ul>
Draw.io	<ul style="list-style-type: none"> <li>• To design functional diagram such as ERD, Flowchart and Use Case</li> </ul>
PHP	<ul style="list-style-type: none"> <li>• To write and run coding for the system</li> </ul>
Xampp	<ul style="list-style-type: none"> <li>• Local web server install to store web pages</li> </ul>
Adobe XD	<ul style="list-style-type: none"> <li>• To design user interface</li> </ul>

Table 3.1 Software Requirement & Purpose

#### 3.3.2 Hardware Requirement

Hardware	Specification	Purpose
Laptop	HP	To develop the proposed system and complete the report
Printer	Epson	Used to print report

Table 3.2 Hardware Requirement & Purpose

System requirements are divided into two categories which are functional and non-functional. Both category brings different meaning which functional requirement is what the system must do, if not the system will fail. Meanwhile, the non-functional requirement is describing how the system should work. The functional and non-functional requirements for developing Scheduled Waste Inventory and Monitoring system are being shown in table 3.3.3 and 3.3.4 below.

### 3.3.3 Functional Requirement

Functional	Description
Login Module	<ul style="list-style-type: none"> <li>The system allow users to login to the system by using authenticate username and password.</li> </ul>
Manage Waste Module	<ul style="list-style-type: none"> <li>The system allow the user to add the scheduled waste information in the required form provided in the system.</li> </ul>
Manage Transporter Module	<ul style="list-style-type: none"> <li>The system allow the user add the information of the shipper who carry the scheduled waste to be disposed in the required form provided in the system.</li> </ul>
Manage Receiver Module	<ul style="list-style-type: none"> <li>The system allow the user add the information of the receiver who will disposed the scheduled in the required form provided in the system.</li> </ul>
Manage Document Module	<ul style="list-style-type: none"> <li>The system allow the user to add the document related to the procedure in handling the scheduled waste in the required form provided in the system.</li> </ul>
Searching Module	<ul style="list-style-type: none"> <li>The system allow the user to search the scheduled waste information</li> </ul>
Calendar Module	<ul style="list-style-type: none"> <li>The system allow the user to fill in the date of the date of disposing scheduled waste including the person in charge.</li> </ul>

Table 3.3 Functional Requirement

### 3.3.4 Non-Functional Requirement

Functional	Description
Security	<ul style="list-style-type: none"><li>To protect the user's information from outsiders attack.</li></ul>
Performance	<ul style="list-style-type: none"><li>To give users better performance throughout using the system during higher workloads.</li></ul>
Usability	<ul style="list-style-type: none"><li>To give better user experience without having any difficulties to understand the flow of the system.</li></ul>

Table 3.4 Non-Functional Requirement

### 3.3.5 User Requirement

A user requirement is a need in order to specify the features need by the users and how the users want the proposed system to works.

#### I. Sign Up and SignIn module

The first time users are needed to have their own account first by registries themselves in the system. After that, new users must sign in to their account by using the email and also the password created earlier by themselves.

#### II. Profile Module

This module is where the user is allowing to add, edit and delete their personal information.

#### III. Searching module

In order to ease the work of the user, user may search the scheduled waste in their inventory to update or delete without the needs to scroll down.

#### IV. Reminder module

This module will allow the user to turn on or turn off the automatic send reminder to the users if the date of disposal scheduled waste is approaching.

#### V. Calendar module

Users are able to assign the person in charge of specific scheduled waste in the calendar for the individual and others to view.

VI. Transportation module

This module will allow the users to fill in the important information regarding the transportation of the scheduled waste.

VII. Inventory module

This module will allow the users to fill in the important information regarding the scheduled waste.

VIII. Receiver module

This module will allow the users to fill in the important information regarding the receiver of the scheduled waste(Guideline, 2015).

### **3.3.6 Admin Requirement**

I. Profile module

This module is where the admin is allowing to add, edit and delete their personal information.

II. View scheduled waste inventory module

This module allows the admin to view all the listed scheduled waste inventory and update the inventory.

III. Edit calendar module

This module allows the admin to edit the disposal date of scheduled waste if the information is not enough based on the listed scheduled waste inventory.

### **3.3.6 Limitation & Constraint**

The Scheduled Waste Inventory and Monitoring system are being develop on planning phase, there are several limitations and constraints has been identified. This limits and constraints have been identified and are described below:

#### **I. Constraints**

##### **Skill constraint**

By default, all the coding implementation phase is done by only one developer for the Scheduled Waste Inventory and Monitoring system. There are few integrations that need to be done for the proposed system. As for example the reminder feature where the system sends reminders to the person in charge by using phone number or email. Due to lack of exposure and never having done this type of integration, it will be more difficult to implement it and this will lead to time constraints.

##### **Time constraint**

Time management is necessary for a project to be successful and there are several time constraints that are being faced during each of the phases of developing the Scheduled Waste Inventory and Monitoring system. It is quite difficult to deliver a project if the client from Flexsys Chemical (M) always asks for changes that have been agreed earlier. Therefore, as a developer, more time needed to do some research and understand the client before making the new changes to avoid any changes again and this will affect the timeline of the project.

#### **II. Limitation**

As the proposed system which is the Scheduled Waste Inventory and Monitoring system is focused only on web-based systems, it has the limitations on the mobile experience. The proposed system might not be run properly on the mobile devices. The design of the system could be totally different from the web-based and the functionality of the system might not function as well.



### 3.4 Propose Design

Propose design will discuss in details about the process and flow of the Scheduled Waste Inventory and Monitoring system through different diagram. Furthermore, the propose design also include database and Graphical User Interface (GUI) of the Scheduled Waste Inventory and Monitoring system.

#### 3.4.1 Flowchart

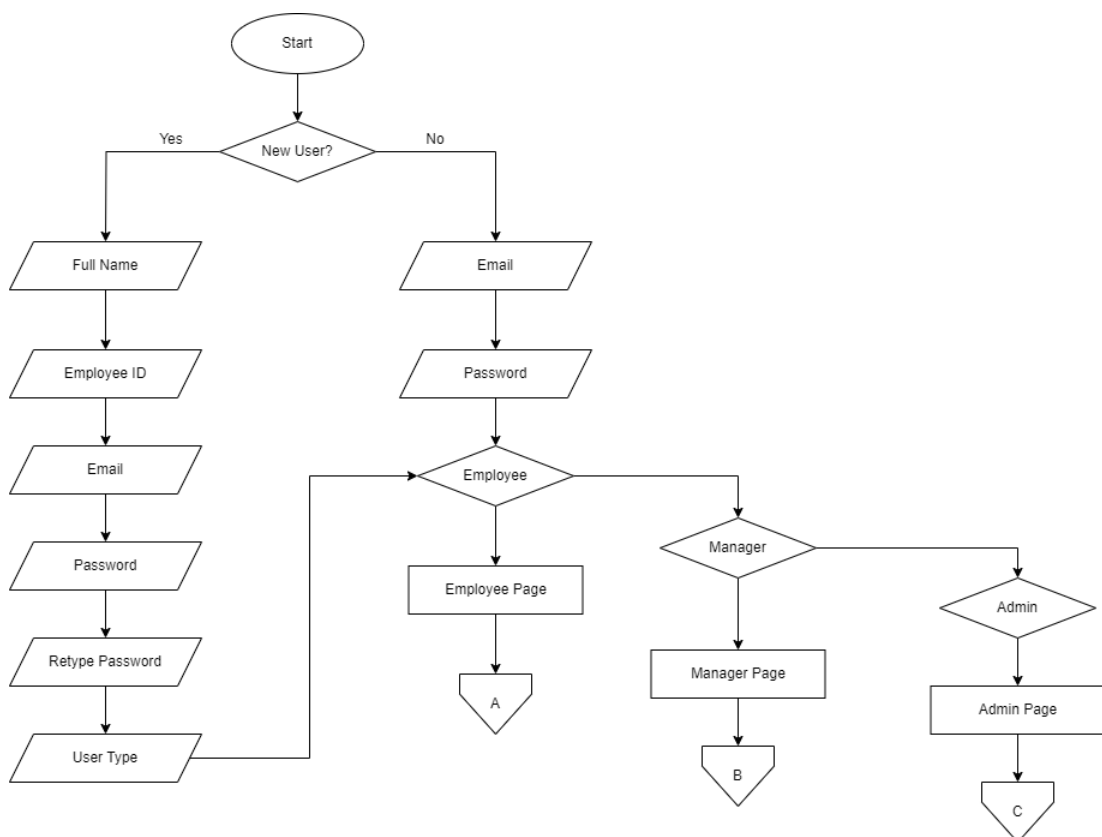


Figure 3.2 Flowchart of Registration

Figure 3.2 above shows the registration and login process. Before users are able to use the system, all users need to be registered first. For the registration process, the users should include details such as name, phone number, address, employee ID, email password and also user type. Once they have been registered, registered users are allowed to login using their email and also the registered password. If the email and password are correct, the users are permitted to access the functionality of the system.

Otherwise, no access is given. After user login into the system, the users are able to upload their profile picture in account setting page.

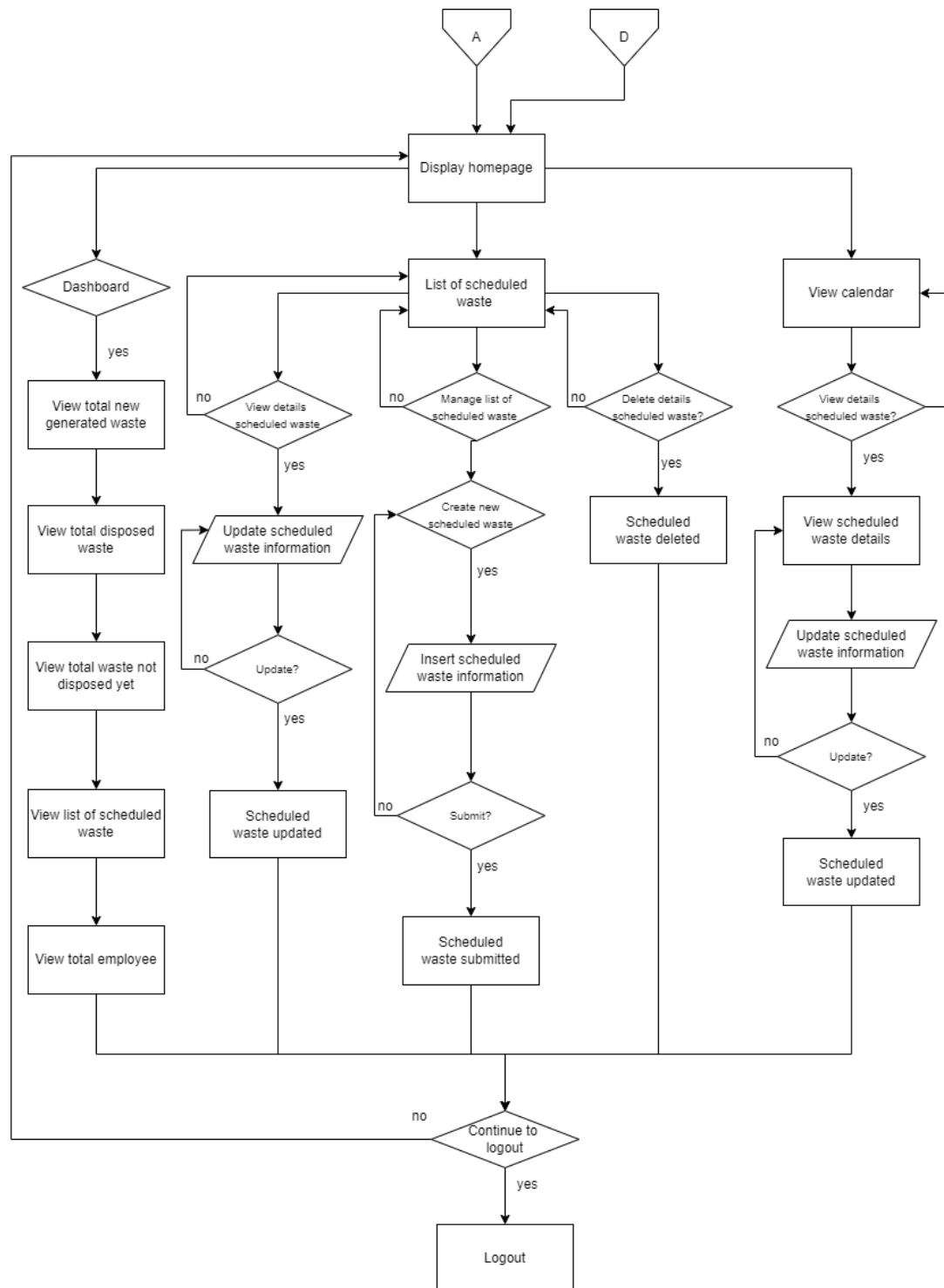


Figure 3.3 Flowchart of Employee Page

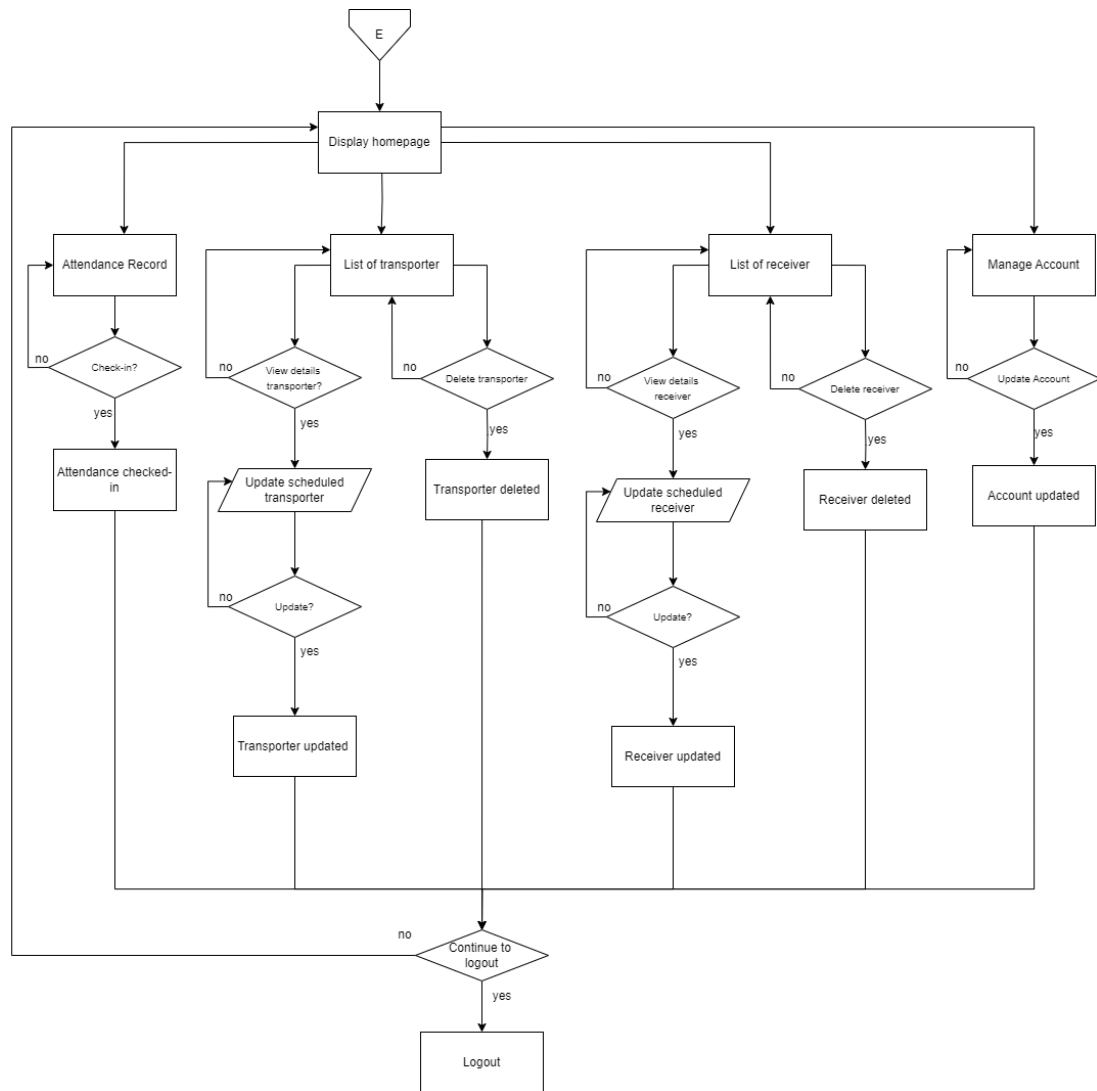


Figure 3.4 Flowchart of Employee Page

Once the users successfully change their password, they are able to use the functionality of the system. Figure 3.3 shows the flowchart and modules if the users are signed in as Employees. The first thing the user will see is the dashboard. In the dashboard module, the users are able to view insightful information such as total of disposed scheduled waste, total of new generated waste, list of scheduled waste and list of files to handle scheduled waste that are uploaded by the other user which is the manager. Moreover, the user is also able to manage the scheduled waste such as add, edit, delete and view the scheduled waste. The date that scheduled waste should be disposed then is displayed on the calendar module in the system.

During filling in the scheduled waste details to be disposed, users are needed to choose the transporter and receiver. If there is a new transporter and receiver, the user which is manager needs to add the details of the transporter and receiver first. Otherwise, just choose from the dropdown menu that has been registered previously. If the transporter is not available anymore, the option for that specific transporter will not be shown in the dropdown menu. User is also able to update and delete the transporter and receiver. Users are also allowed to update their profile on their own including their profile picture. User also can update and delete the scheduled waste based on the situation.

Furthermore, user is also able to view the calendar. The calendar will display all the created scheduled waste by the user and user able to click on the event. After user click on the event, user have the option to edit and update the scheduled waste information.

Based on the figure 3.4 user are able to view, update and delete the information of the transporter and receiver. This will ease the user in order to choose the available transporter and receiver based on the list given before fill in the scheduled waste information. However, the user is not able to add new list of transporter and also the receiver. Besides, user need to record their attendance for the manager to supervise the employee. User is allowed to update their details such as profile picture, full name, phone number and email.

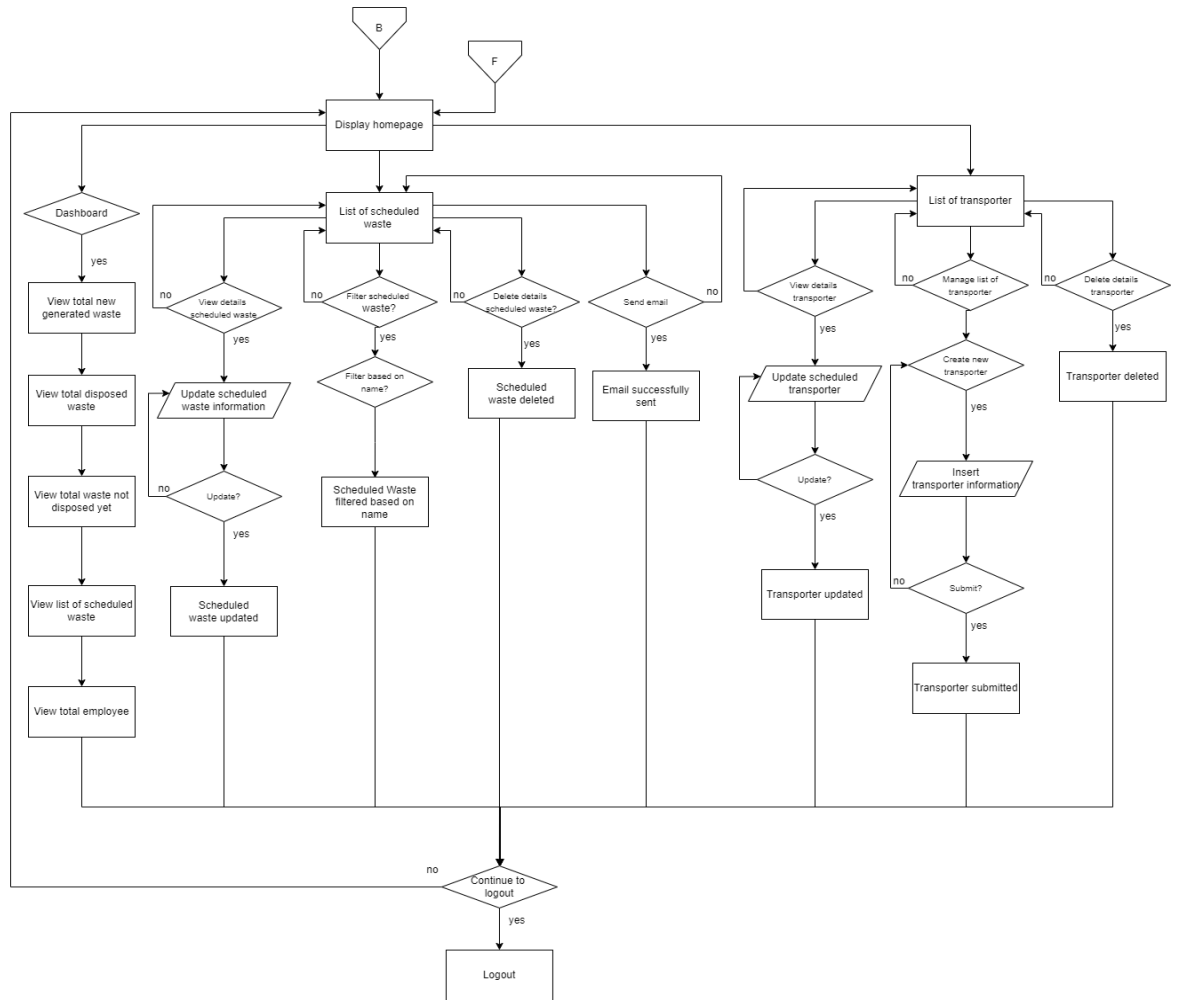


Figure 3.4 Flowchart of Manager Page

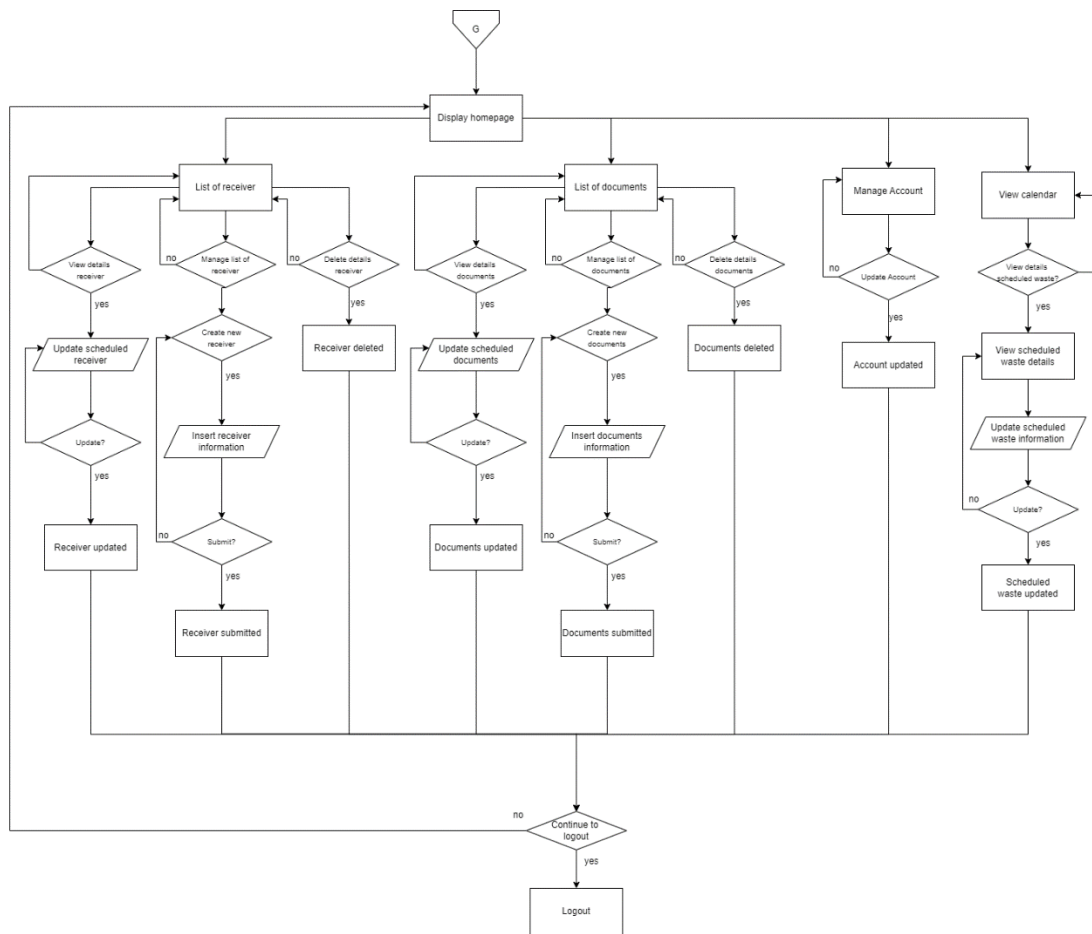


Figure 3.5 Flowchart of Manager Page

Figure 3.4 and figure 3.5 shows the flowchart and modules for manager. Same as employees, after successful login into the system, users are able to view insightful information such as total new generated scheduled waste, total waste disposed, total waste that is pending to be disposed and also total employee in graph and chart diagram to ease the user. Furthermore, the manager is able to view the created list of scheduled waste by the employee. In addition, the user is able to send the email notification by click on the Email button in the system. The receiver of the email will get the email notification through Gmail.

In this system, transporter and receiver are needed for the disposal of scheduled waste process. The details of the transporter and receiver are being added by the user and the user also able to update and delete the details. All the list of transporter and receiver will be displayed to in the user category employee.

Since there are few types of scheduled waste that need to be disposed, employees have the tendency to forget the standard operating procedure in handling the scheduled waste. Therefore, the manager is able to upload a file which is the S.O.P in handling the present scheduled waste. Then, the system will display the files in the employees view too. Furthermore, user is also able to view the calendar. The calendar will display all the created scheduled waste by the user and user able to click on the event. After user click on the event, user have the option to edit and update the scheduled waste information.

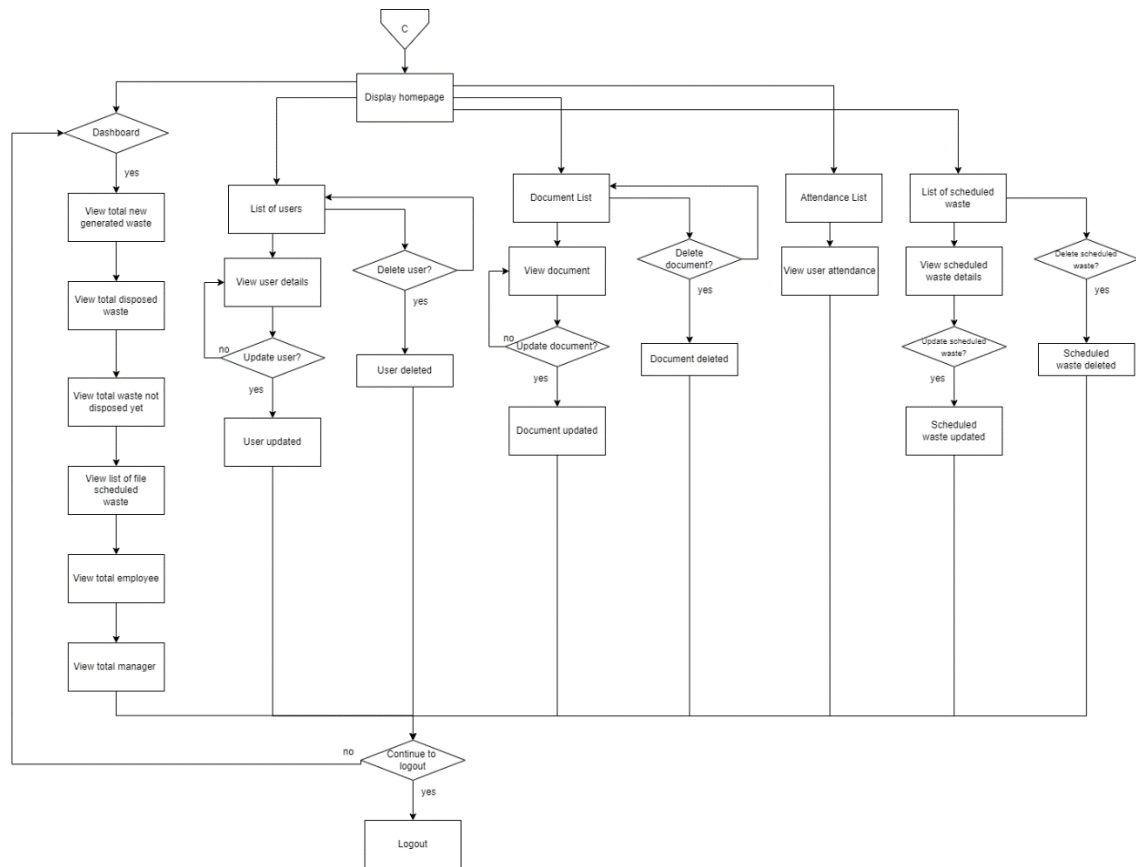


Figure 3.6 Flowchart of Admin Page

Figure 3.6 shows the flowchart for admin. Admin are able to view all the insightful information such as total new generated waste, total disposed waste, pending of disposal waste, total employee and manager. Besides, the admin is also able to view a list of files to handle scheduled waste in order to verify the content of the file and allows users to update or delete the files. Furthermore, admin is able to view all the users in the system which include the Flexsys Chemical workers and also the receiver and transporter. The attendance of the Flexsys Chemical workers also being displayed in the admin page as to monitor the movement of the workers. The most important thing, the admin also able to view all the scheduled waste information.



### 3.4.2 Context Diagram

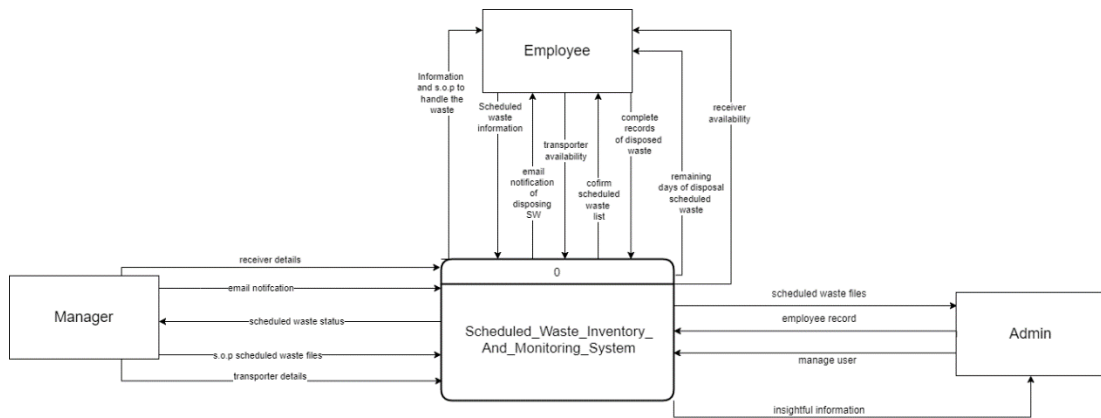


Figure 3.7 Context diagram for Scheduled Waste Inventory and Monitoring system

Figure 3.7 shows the context diagram of the Schedules Waste Inventory and Monitoring system. The proposed system comprises three actors which are employee, manager and also admin. The employee will record the transporter details and scheduled waste information into the system so that the manager is able to view and monitor the scheduled waste. Furthermore, the system will send alert notification to the employee a few days before the waste needs to be disposed.

Moreover, the manager monitored the date that the scheduled waste should be disposed and sent a message by email to the employee. Manager also will retrieve the scheduled waste status from the system that is updated by the employee. Besides, the manager is able to upload s.o.p files to handle the scheduled waste and also add a list of scheduled waste generated and also the waste that might be produced by the factory.

In addition, the admin of the Scheduled Waste Inventory and Monitoring system will register all users in order for them to have access to the system. Admin also will observe the content of the files that are uploaded by the manager in order to avoid inappropriate content.

### 3.4.3 Use Case Diagram

Figure 3.8 shows the use case diagram of Scheduled Waste Inventory and Monitoring system. It also includes the use case description for the proposed system.

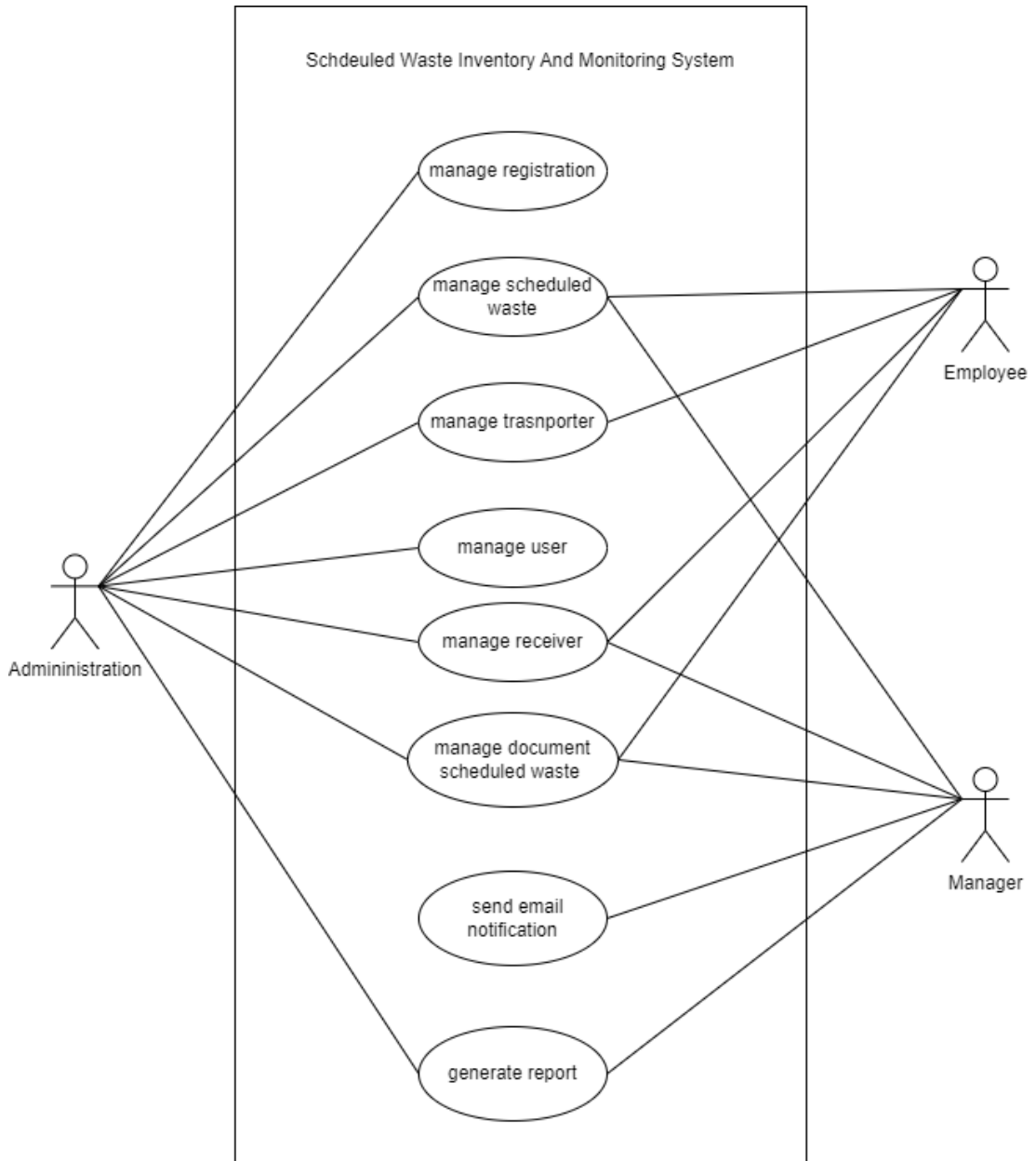
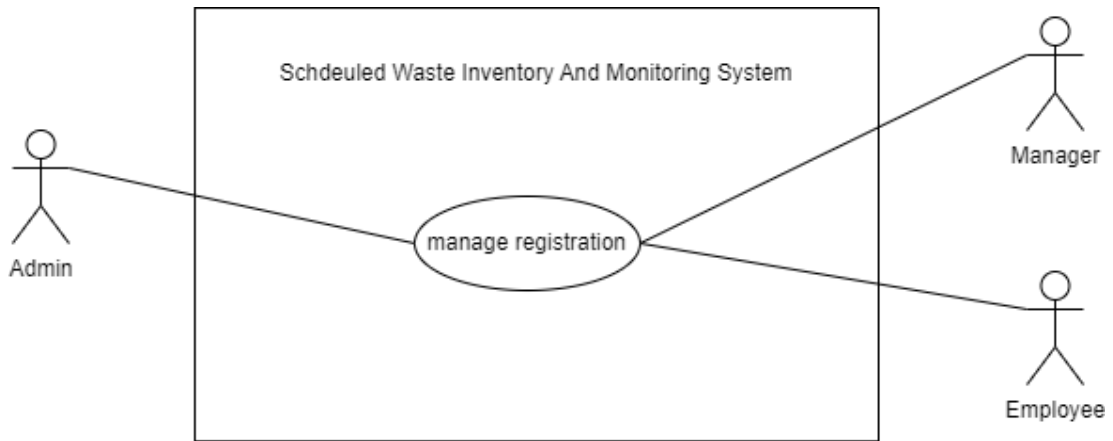


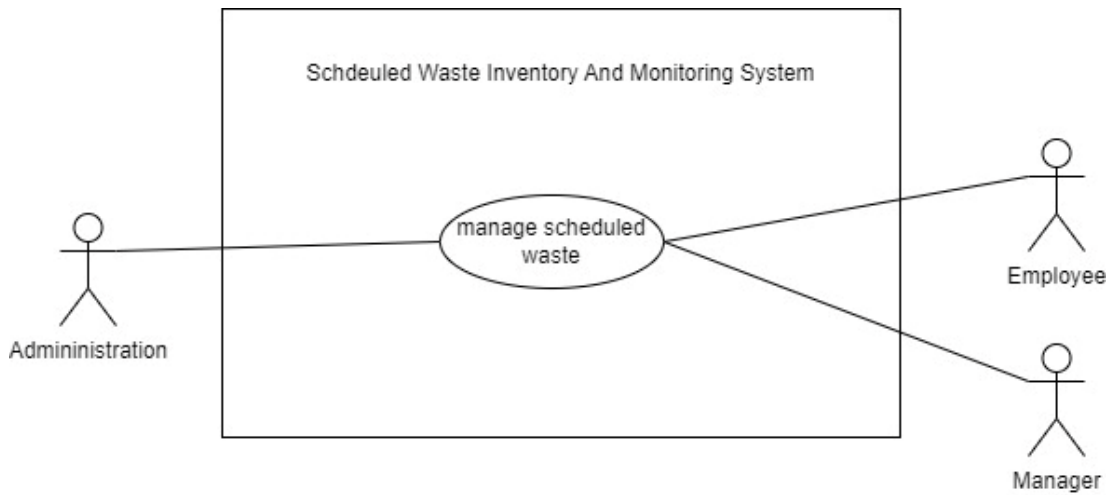
Figure 3.8 Use Case for Scheduled Waste Inventory and Monitoring system

Table 3.5 Use case description for manage registration



Use Case Name	Manage Registration
Brief Description	This use case is describes all users which are Manager and Employee registration process.
Actor	Manager, Employee
Pre-Conditions	<ul style="list-style-type: none"> <li>• User must have stable internet connection</li> <li>• Users must be either the employee of Flexsys Company from Safety Department.</li> </ul>
Basic Flow	<ol style="list-style-type: none"> <li>1. The use case starts when click on Registration button in the registration page in the login page.</li> <li>2. The system displays a form for users to fill in.</li> <li>3. Users fill in the form [E1: Email and password is registered] [R1: Email and password should be unique]</li> <li>4. The system shows confirmation box</li> <li>5. Users click on OK and data will be saved in database</li> <li>6. Users update their profile picture.</li> <li>7. The use case end</li> </ol>
Alternative Flow	None
Exception Flow	E1: Email and password is registered <ol style="list-style-type: none"> <li>1. System display an error message</li> <li>2. Users click on OK button</li> <li>3. Continue with step 3 in basic flow</li> </ol>
Post-Conditions	Employee are registered to scheduled waste inventory and monitoring system and able to access the system
Constraints	none

Table 3.6 Use case description for manage scheduled waste

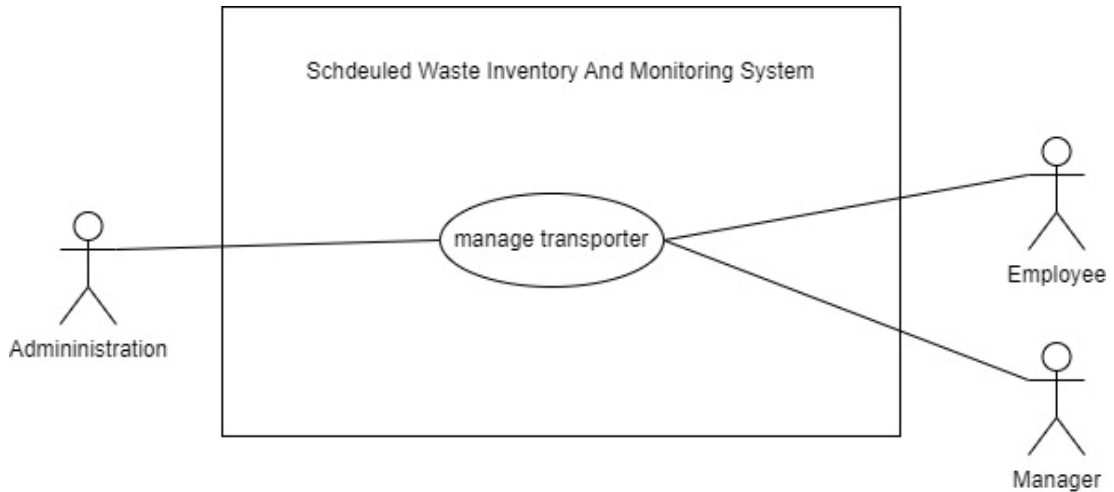


Use Case Name	Manage scheduled waste
Brief Description	This use case is used by employee of Safety Department in Flexsys Company to view, add, delete, update and search scheduled waste. The manager and employee are able to view and add the scheduled waste list. Admin able to view only.
Actor	Employee, Manager
Pre-Conditions	<ul style="list-style-type: none"> <li>Users already login into the system.</li> </ul>
Basic Flow	<p>Employee</p> <ol style="list-style-type: none"> <li>The use case begins with employee click on the Schedule Waste list button.</li> <li>The system will retrieve the data from the database.</li> <li>The system displays the list of the scheduled waste page.</li> <li>If the employee wants to add new scheduled waste, they can click on Add New Waste button.</li> <li>The system will request the details that need to be filled in for scheduled waste from the database.</li> <li>The system displays the Add New Scheduled Waste page.</li> <li>Employee enters all information and click on Submit button.</li> <li>The system stores the data into database.</li> <li>To cancel add new scheduled waste, click on Cancel button.</li> <li>The system displays the information that just been added.</li> <li>The system displays the date of scheduled waste must be disposed in calendar page.</li> <li>The use case end.</li> </ol> <p>Manager</p>

	<ol style="list-style-type: none"> <li>1. The use case begins with users click on Scheduled Waste List button on the side navigation bar.</li> <li>2. The system retrieve data from database.</li> <li>3. The system displays Scheduled Waste List page and the data.</li> <li>4. To send alert email to the Employee, click on Send button.</li> <li>5. The system allows the users to view the scheduled waste before viewing it: <ol style="list-style-type: none"> <li>i. Search Scheduled Waste List [A1: Search Scheduled Waste][E1: Scheduled waste must be registered]</li> </ol> </li> <li>6. To view the details of the scheduled waste, users click on View button on the on the Scheduled Waste List page.</li> <li>7. The system will retrieve the data.</li> <li>8. The system displays the data to the specific chosen waste by the user to view.</li> <li>9. To update the data, users can click on Edit button.</li> <li>10. The system will retrieve the data from database.</li> <li>11. The system displays the data on Edit Scheduled Waste page.</li> <li>12. Users click on Update button if already altered the information.</li> <li>13. The system will show confirmation message, click on OK button if confirm to update the information.</li> <li>14. The system will save the new information in the database.</li> <li>15. To delete the scheduled waste list, user must click on Delete button in Scheduled Waste List page.</li> <li>16. The system shows confirmation message, click OK button to proceed with delete and Cancel button to not delete the data.</li> <li>17. If the users click on OK button the data will be deleted from the database and users cannot view the data anymore.</li> </ol>
Alternative Flow	<p>A1: Search scheduled waste</p> <ol style="list-style-type: none"> <li>1. Users enter the name of the scheduled waste and click on Search button.</li> <li>2. The system requests the data with similar name entered earlier from database.</li> <li>3. The system displays all the scheduled waste list with similar name entered before.</li> <li>4. The use case continues with next step in basic flow.</li> </ol>

Exception Flow	E1: The waste must be registered <ol style="list-style-type: none"> <li>1. Users must add the scheduled waste into the system.</li> <li>2. The system will store the information in the database.</li> </ol>
Post- Conditions	All information are save into the database.
Constraints	None

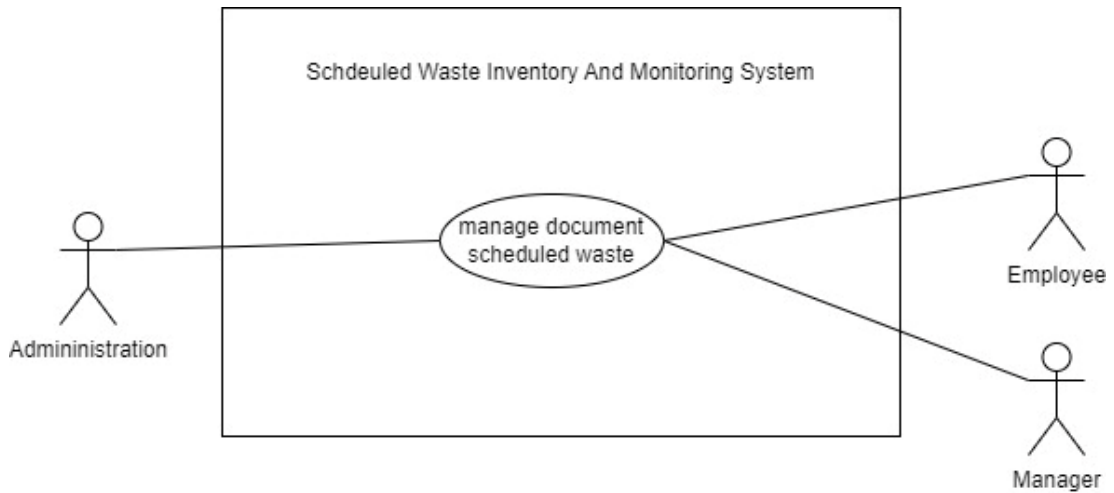
Table 3.7 Use case description for manage transporter



Use Case Name	Manage transporter
Brief Description	This use case is used by employee of Safety Department in Flexsys Company to view, add, delete, update and search transporter. The employee and admin are able to view the transporter.
Actor	Employee, Manager, Admin
Pre-Conditions	<ul style="list-style-type: none"> <li>• Users already login into the system.</li> </ul>
Basic Flow	<p>Manager</p> <ol style="list-style-type: none"> <li>1. The use case begins with users click on Transporter button on the side navigation bar.</li> <li>2. The system retrieve data from database.</li> <li>3. The system displays Transporter List page and the data.</li> <li>4. The system allows the users to view the transporter information before viewing it: <ol style="list-style-type: none"> <li>ii. Search Transporter List [A1: Search Transporter][E1: Transporter must be registered]</li> </ol> </li> <li>5. To view the details of the transporter, users click on View button.</li> <li>6. The system will retrieve the data.</li> <li>7. The system displays the data to the specific chosen transporter by the user to view.</li> <li>8. To update the data, users can click on Edit button.</li> </ol>

	<ol style="list-style-type: none"> <li>9. The system will retrieve the data from database.</li> <li>10. The system displays the data on Edit Transporter page.</li> <li>11. Users click on Update button if already altered the information.</li> <li>12. The system will show confirmation message, click on OK button if confirm to update the information.</li> <li>13. The system will save the new information in the database.</li> <li>14. To delete the transporter list, user must click on Delete button in Transporter List page.</li> <li>15. The system shows confirmation message, click OK button to proceed with delete and Cancel button to not delete the data.</li> <li>16. If the users click on OK button the data will be deleted from the database and users cannot view the data anymore.</li> </ol>
Alternative Flow	<p>A1: Search transporter</p> <ol style="list-style-type: none"> <li>1. Users enter the name of the transporter and click on Search button.</li> <li>2. The system requests the data with similar name entered earlier from database.</li> <li>3. The system displays all the transporter list with similar name entered before.</li> <li>4. The use case continues with next step in basic flow.</li> </ol>
Exception Flow	<p>E1: The transporter must be registered</p> <ol style="list-style-type: none"> <li>1. Users must add the transporter into the system.</li> <li>2. The system will store the information in the database.</li> </ol>
Post- Conditions	All information are save into the database.
Constraints	None

Table 3.8 Use case description for manage document scheduled waste

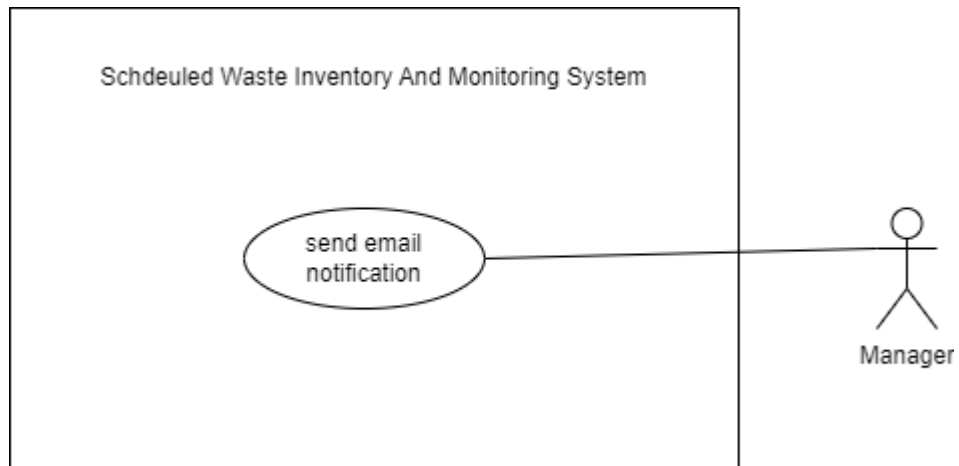


Use Case Name	Manage document scheduled waste
Brief Description	<p>This use case is used by manager of Safety Department in Flexsys Company to view, add, delete, update and search document to handle each scheduled waste.</p> <p>This module allows the manager to upload the documentation for standing operating procedure in handling the scheduled waste. The Admin and Employee are able to view the documentation.</p> <p>The employee, manager and admin are able to view the documentation.</p>
Actor	Manager
Pre-Conditions	<ul style="list-style-type: none"> <li>Users already login into the system.</li> </ul>
Basic Flow	<p>Manager</p> <ol style="list-style-type: none"> <li>The use case begins with user click on S.O.P file lists on navigation side bar.</li> <li>The system request data from database.</li> <li>The system displays the list of files information on List of Files page.</li> <li>To upload a new file, users click on Upload New file button.</li> <li>The system displays the new uploaded file in List of Files page.</li> <li>The system stores the data into database.</li> <li>To cancel uploading a new file, click on Cancel button.</li> <li>If not, the system displays the new uploaded file that just been added.</li> <li>The system allows the users to view the list of files before viewing it:</li> <li>The system will retrieve the data.</li> <li>The system displays the information to the specific chosen list of files by the user to view.</li> </ol>



	<ol style="list-style-type: none"> <li>12. To update the file, users can click on Edit button.</li> <li>13. The system will retrieve the data from database.</li> <li>14. The system displays the data on Edit List of Files page.</li> <li>15. Users click on Update button if already altered the information.</li> <li>16. The system will show confirmation message, click on OK button if confirm to update the information.</li> <li>17. The system will save the new file in the database.</li> <li>18. To delete the file, user must click on Delete button.</li> <li>19. The system shows confirmation message, click OK button to proceed with delete and Cancel button to not delete the data.</li> <li>20. If the users click on OK button the data will be deleted from the database and users cannot view the data anymore.</li> </ol>
Alternative Flow	<p>A1: Search list of file</p> <ol style="list-style-type: none"> <li>1. Users enter the name of the file and click on Search button.</li> <li>2. The system requests the data with similar name entered earlier from database.</li> <li>3. The system displays all the list of file with similar name entered before.</li> <li>4. The use case continues with next step in basic flow.</li> </ol>
Exception Flow	<p>E1: The list of scheduled waste must be registered</p> <ol style="list-style-type: none"> <li>1. Users must add the list of scheduled waste into the system.</li> <li>2. The system will store the information in the database.</li> </ol>
Post- Conditions	All information are save into the database.
Constraints	None

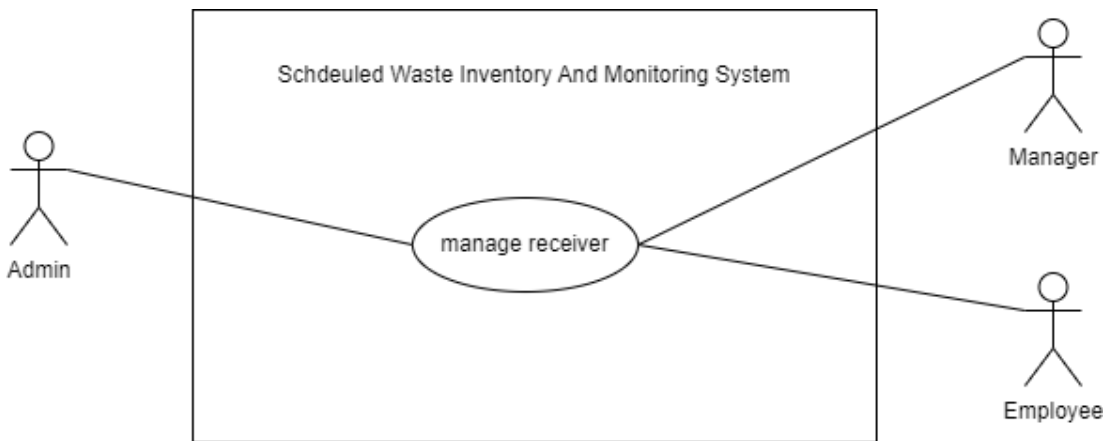
Table 3.9 Use case description for send alert notification



Use Case Name	Send alert notification
Brief Description	This use case is used by manager of Safety Department in Flexsys Company to alert the employee of days to dispose the scheduled waste. The employee, manager and admin are able to view the documentation.
Actor	Manager
Pre-Conditions	<ul style="list-style-type: none"> <li>Users already login into the system.</li> </ul>
Basic Flow	<p>Manager</p> <ol style="list-style-type: none"> <li>The use case begins with user click on Disposal Scheduled Waste on navigation side bar.</li> <li>The system request data from database.</li> <li>The system displays the list of files information on Disposal Scheduled Waste page.</li> <li>User are allowed to             <ol style="list-style-type: none"> <li>Filter waste through day[A2 - Filter waste through day]</li> <li>Sort waste through day[A3 - Sort waste through day]</li> </ol> </li> <li>The system displays the Scheduled Waste list according to remaining day.</li> <li>User send email and message to employee.</li> <li>The system alerts the person in charge by the sent email.</li> <li>The system stores the data into database.</li> <li>If the users click on OK button the data will be deleted from the database and users cannot view the data anymore.</li> </ol>
Alternative Flow	<p>A1: Filter waste through day</p> <ol style="list-style-type: none"> <li>Enter the number of days remaining to view the upcoming disposal of scheduled waste.</li> <li>The system requests the data.</li> </ol>

	<ol style="list-style-type: none"> <li>3. The system displays all the list of scheduled waste with similar remaining day to be disposed.</li> <li>4. The use case continues with next step in basic flow.</li> </ol> <p>A1: Sort waste through day</p> <ol style="list-style-type: none"> <li>1. Choose either to view decreasing or increasing remaining days of scheduled waste disposal The system requests the data.</li> <li>2. The system displays all the list of scheduled waste with similar remaining day to be disposed accordingly to the chosen sort.</li> <li>3. The use case continues with next step in basic flow.</li> </ol>
Exception Flow	<p>E1: The scheduled waste must be registered</p> <ol style="list-style-type: none"> <li>1. Users must add the list of scheduled waste into the system.</li> <li>2. The system will store the information in the database.</li> </ol>
Post- Conditions	All information are save into the database.
Constraints	None

Table 3.10 Use case description for manage receiver



Use Case Name	Manage receiver
Brief Description	This use case is used by employee of Safety Department in Flexsys Company to view, add, delete, update and search transporter. The manager and admin are able to view the transporter.
Actor	Employee, Manager, Admin
Pre-Conditions	<ul style="list-style-type: none"> <li>• Users already login into the system.</li> </ul>
Basic Flow	<p>Employee</p> <ol style="list-style-type: none"> <li>1. The use case begins with user click on Receiver on navigation side bar.</li> <li>2. The system request data from database.</li> </ol>

	<ol style="list-style-type: none"> <li>3. The system displays the receiver information on Receiver page.</li> <li>4. The system will request the details that need to be filled in for receiver information from the database.</li> <li>5. The use case end.</li> </ol> <p>Manager</p> <ol style="list-style-type: none"> <li>1. The use case begins with users click on Receiver button on the side navigation bar.</li> <li>2. The system retrieve data from database.</li> <li>3. The system displays Receiver List page and the data.</li> <li>4. The system allows the users to view the receiver information before viewing it: <ol style="list-style-type: none"> <li>iii. Search Receiver List [A1: Search Receiver][E1: Receiver must be registered]</li> </ol> </li> <li>5. To view the details of the receiver, users click on View button.</li> <li>6. The system will retrieve the data.</li> <li>7. The system displays the data to the specific chosen receiver by the user to view.</li> <li>8. To update the data, users can click on Edit button.</li> <li>9. The system will retrieve the data from database.</li> <li>10. The system displays the data on Edit Transporter page.</li> <li>11. Users click on Update button if already altered the information.</li> <li>12. The system will show confirmation message, click on OK button if confirm to update the information.</li> <li>13. The system will save the new information in the database.</li> <li>14. To delete the receiver list, user must click on Delete button in Receiver List page.</li> <li>15. The system shows confirmation message, click OK button to proceed with delete and Cancel button to not delete the data.</li> <li>16. If the users click on OK button the data will be deleted from the database and users cannot view the data anymore.</li> </ol>
Alternative Flow	<p>A1: Search transporter</p> <ol style="list-style-type: none"> <li>1. Users enter the name of the receiver and click on Search button.</li> <li>2. The system requests the data with similar name entered earlier from database.</li> </ol>

	<ul style="list-style-type: none"> <li>3. The system displays all the receiver list with similar name entered before.</li> <li>4. The use case continues with next step in basic flow.</li> </ul>
Exception Flow	<p>E1: The receiver must be registered</p> <ul style="list-style-type: none"> <li>1. Users must add the receiver into the system.</li> <li>2. The system will store the information in the database.</li> </ul>
Post- Conditions	All information are save into the database.
Constraints	None

### 3.4.4 Activity Diagram

Figure 3.9 shows the activity diagram for Scheduled Waste Inventory and Monitoring system.

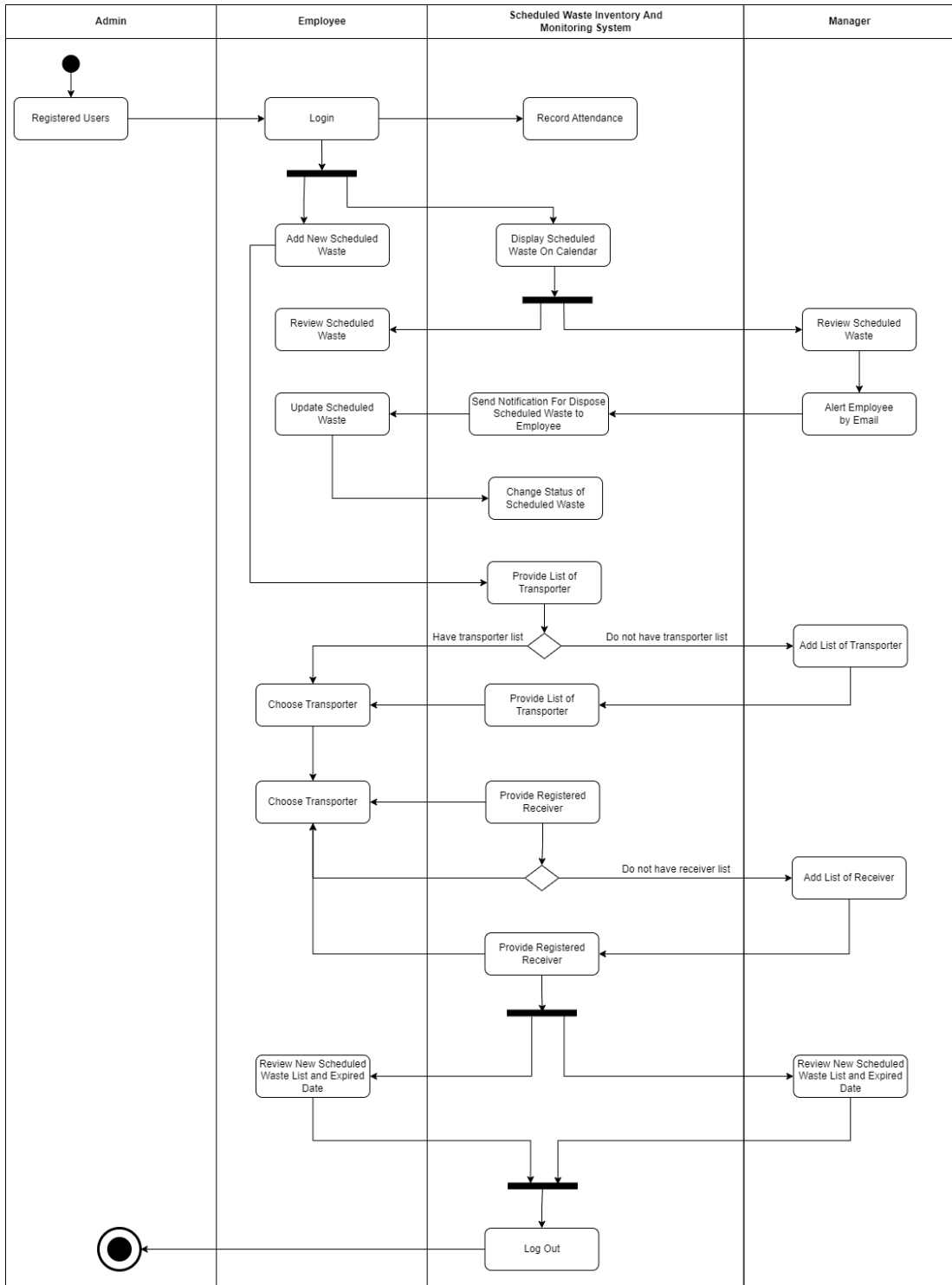


Figure 3.9 Activity Diagram for Scheduled Waste Inventory and Monitoring system

### 3.4.5 Storyboard

Figure 3.9 below shows the login page for admin, employee and also manager. All the users have the same interface for login session. The logo of the company is located at the left top of the header and the system name is in the middle. The logo of the website is located on the left side of the login details.



Figure 3.10 Login Page

After users are authorized, it will redirect the users to the particular dashboard for each type user. Figure 3.10 shows the dashboard for an employee. At the dashboard, there are few insightful information such as total generated new waste, total waste dispose, total pending dispose of scheduled waste, and recent list of file in handling the scheduled waste upload by the manager. User also able to search the scheduled waste by name in order to view the details of it.

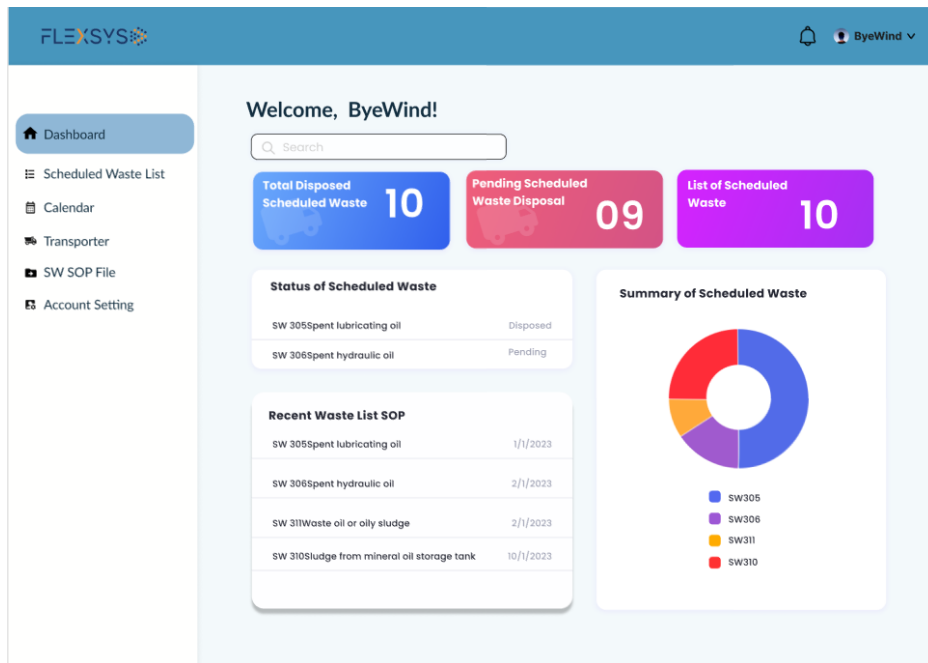


Figure 3.11 Employee-Dashboard Page

In figure 3.12 it shows form to fill in the scheduled waste details. The generated date and the expired date is very important because it is use to alert the user once the scheduled waste was being kept in the system for a certain period of time. However, all the details must be filled in by the user before click on the submit button.

The 'Add New Waste' form includes the following fields:

- Waste Code
- Weight (lb)
- Waste Description
- Disposal site
- Waste Type
- Type of packaging (dropdown)
- Physical State
- Disposal status (dropdown)
- Waste Generated Date (calendar icon)
- Person In Charge
- Waste Expired Date (calendar icon)
- Transporter (dropdown)

Buttons for 'Submit' and 'Cancel' are located at the bottom right of the form.

Figure 3.12 Employee-Add New List



In figure 3.13 it shows the scheduled waste list. This page is being displayed after the user fill in the scheduled waste information as shown in the figure 3.11. Once the user clicks on the Submit button, the system will generate a barcode for each new added scheduled waste. This page also displays the remaining day of the scheduled waste need to be disposed. If the user not update the status of the waste, the system will alert the user. Users are also allowed to search the waste by name and this will ease them without the needs to scroll down to find their scheduled waste. Users need to click on the View button in order to view more details of the information of the scheduled waste as shown in figure 3.14 and Delete button to delete the waste.

ID	Disposal Date	Scheduled Waste	Status	Day Remaining	Barcode	Action
1	25 Dec 2022	SW305	Pending	3		<a href="#">View</a> <a href="#">Delete</a>
2	24 Dec 2022	SW306	Pending	5		<a href="#">View</a> <a href="#">Delete</a>
3	26 Dec 2022	SW307	Disposed	0		<a href="#">View</a> <a href="#">Delete</a>
4	26 Jan 2023	SW310	Disposed	0		<a href="#">View</a> <a href="#">Delete</a>
5	27 Jan 2023	SW311	Disposed	0		<a href="#">View</a> <a href="#">Delete</a>

Figure 3.13 Employee-Scheduled Waste List

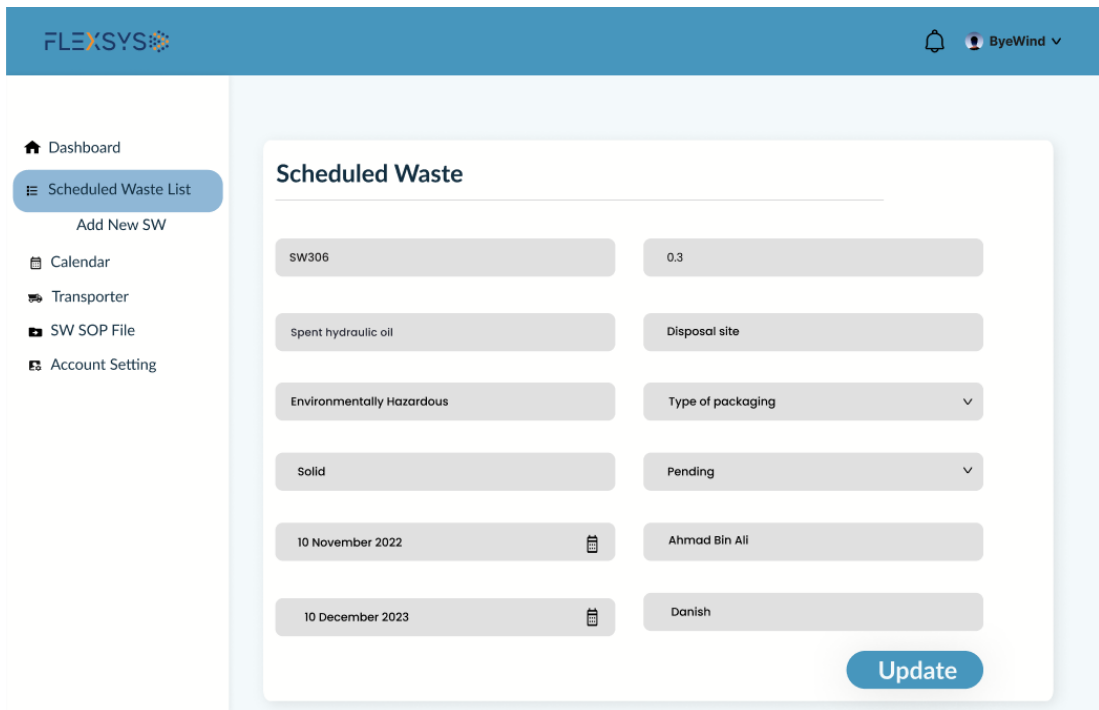


Figure 3.14 Employee-Waste List View

Figure 3.15 below shows the transporter details that need to be filled in order to ease the user to choose the transporter from dropdown menu during filling in the add new scheduled waste.

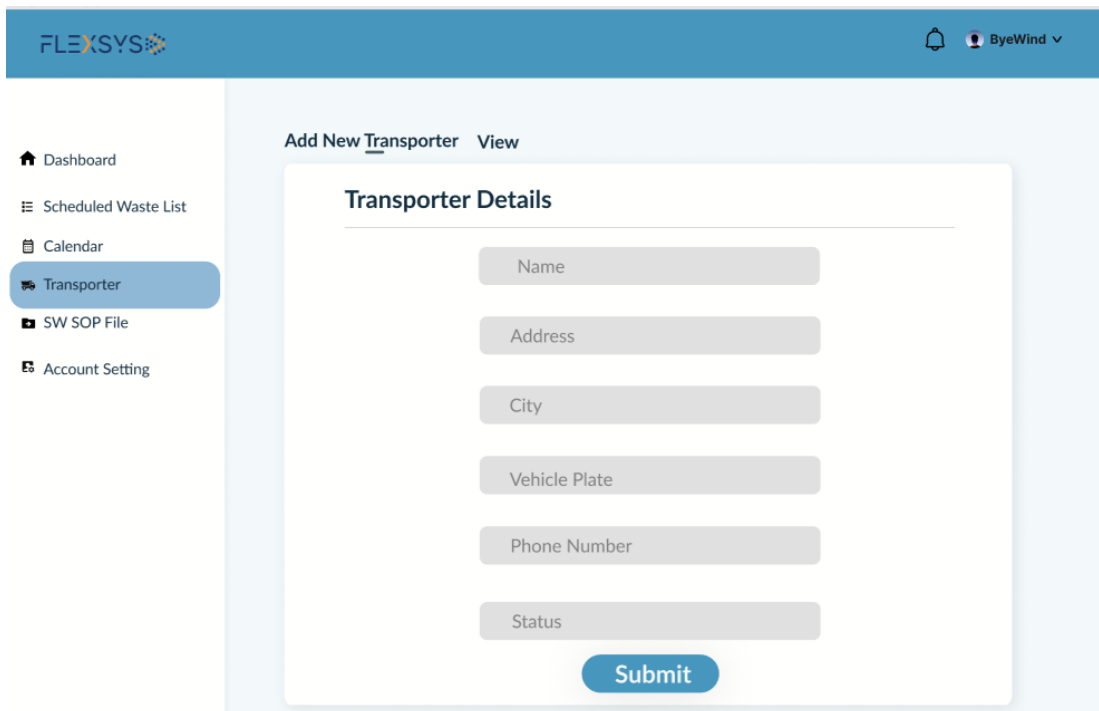


Figure 3.15 Employee-Add Transporter

Figure 3.16 shows the list of transporter that has been added by the users. Users are able to search the transporter name in order to view the details information or also want to update the details by clicking on the View button on the right side.

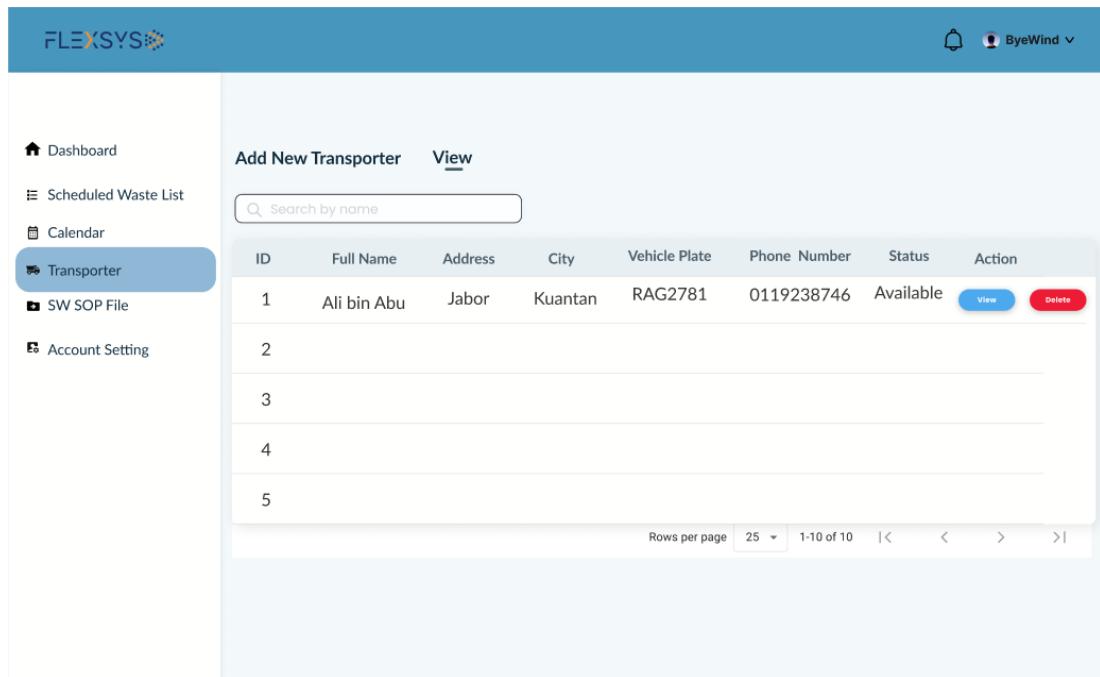


Figure 3.16 Employee-View Transporter

Figure 3.16 shows below displays the lists of files that has been uploaded by the manager. Users are able to view the files just by click on the View button. Besides, users are also allowed to search the wanted file in the search bar since there are many files and it is inconvenient for users to scroll down the page.

**SW S.O.P File List**

All View

Search by name

ID	Scheduled Waste	File Name	Action
1	SW305	SOP Handling SW305 Spent Lubricating Oil	<a href="#">View</a> <a href="#">Delete</a>
2	SW306	SOP Handling SW306 Spent Hydarulic Oil	<a href="#">View</a> <a href="#">Delete</a>
3	SW307	SOP Handling SW307 Spent Mineral oil-water	<a href="#">View</a> <a href="#">Delete</a>
4	SW310	SOP Handling SW310 Sludge	<a href="#">View</a> <a href="#">Delete</a>
5	SW311	SOP Handling SW311 Waste oil	<a href="#">View</a> <a href="#">Delete</a>

Rows per page 25 1-10 of 10

Figure 3.17 Employee-Upload file

Figure 3.18 shows the calendar where all the added scheduled waste will display in the calendar according to the date it should be disposed. This will ease the users to view all the important dates in one page for that particular months.

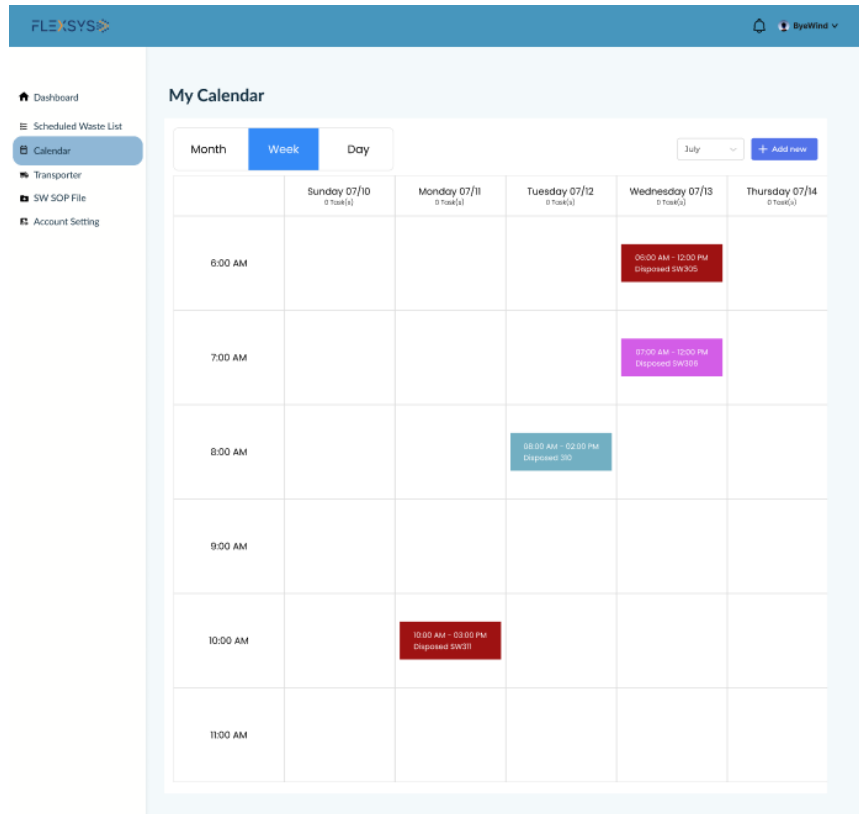


Figure 3.18 Employee-Calendar

Figure 3.19 shows the dashboard page for the manager view. The information is just the same as the Employee view.

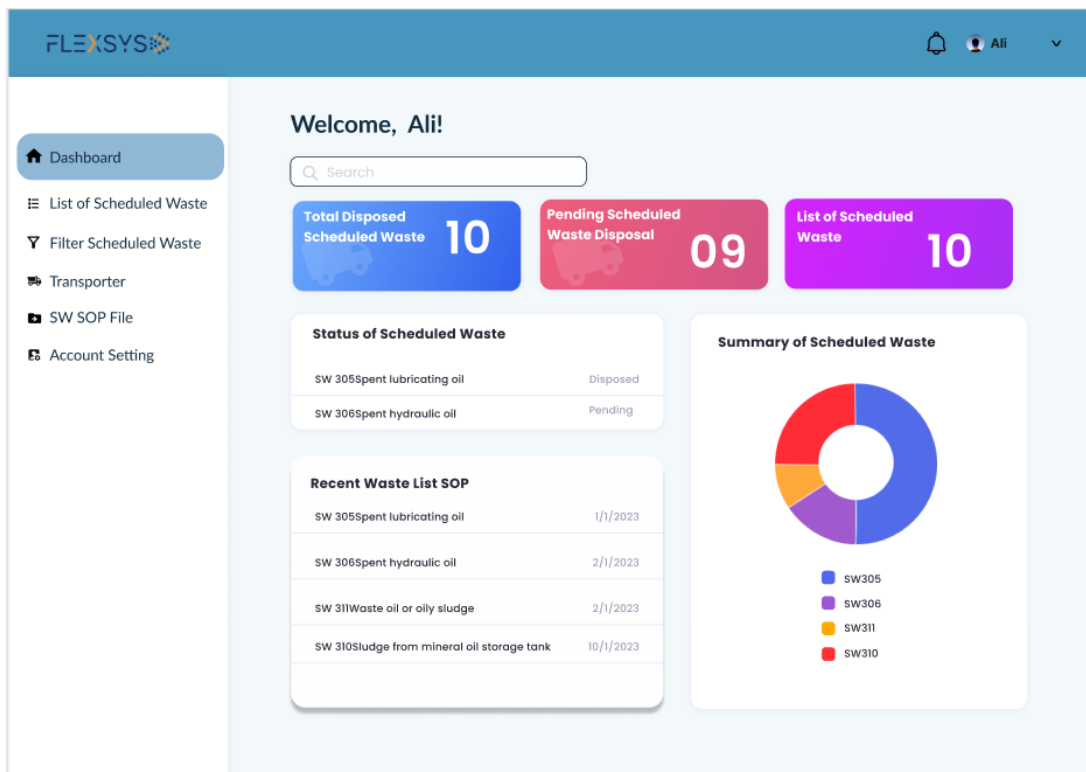


Figure 3.19 Manager-Dashboard

Figure 3.20 shows the lists of scheduled waste s.o.p file that has been upload. The users are allowed to view and delete the files by click on the View or Delete button on the right side. Users also allowed to upload a new file as shown in figure 3.20 by clicking on the New file yellow button at the top of the files lists table.

The screenshot displays the 'SW SOP File' management interface. On the left is a sidebar with navigation links: Dashboard, List of Scheduled Waste, Filter Scheduled Waste, Transporter, SW SOP File (highlighted), and Account Setting. The main content area features a search bar labeled 'Search by name' and a 'New File' button. Below is a table with the following data:

ID	Scheduled Waste	File Name	Action
1	SW305	SOP Handling SW305 Spent Lubricating Oil	View Delete
2	SW306	SOP Handling SW306 Spent Hydarulic Oil	View Delete
3	SW307	SOP Handling SW307 Spent Mineral oil-water	View Delete
4	SW310	SOP Handling SW310 Sludge	View Delete
5	SW311	SOP Handling SW311 Waste oil	View Delete

At the bottom of the table, there is a pagination control showing 'Rows per page' set to 25, and '1-10 of 10' items, with navigation arrows.

Figure 3.20 Manager-SOP File View

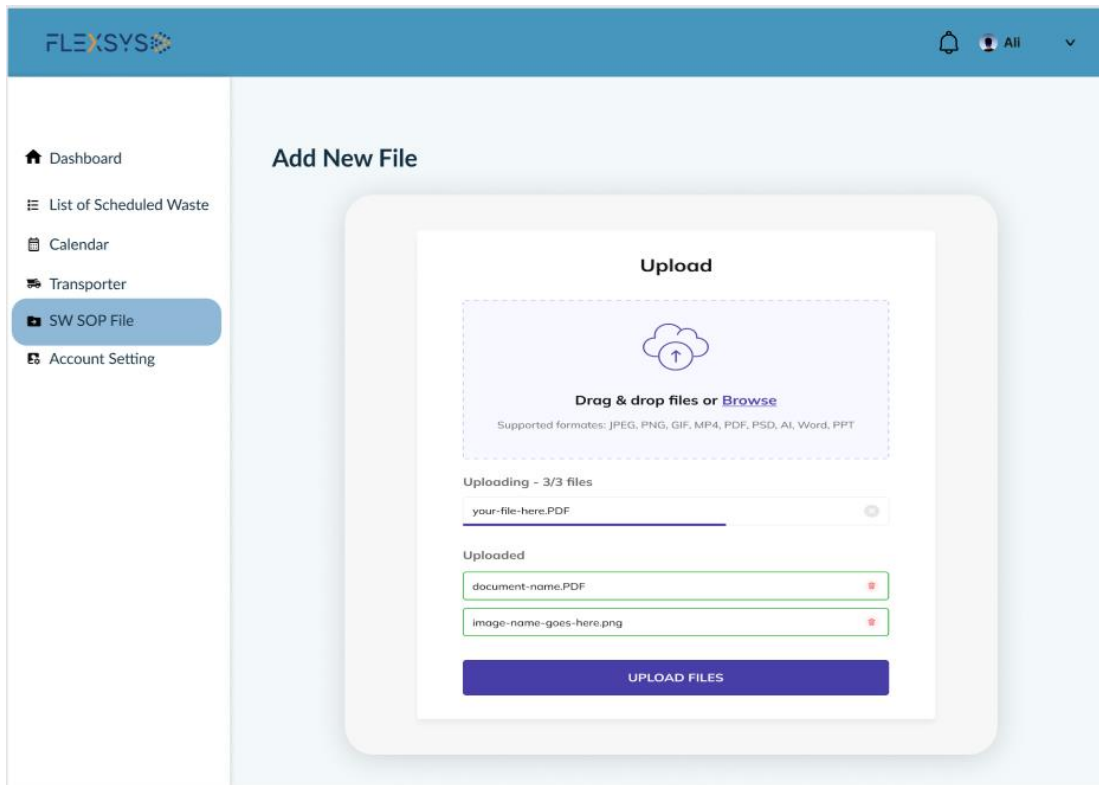


Figure 3.21 Manager-Upload file

Furthermore, in figure 3.22 is for the user to filter the scheduled waste based on the remaining day to be disposed. If the user clicks on 3 days left on the left side of the table, the system will display all the list of scheduled waste that need to be disposed within 3 days. Users are able to view the details and send the message to person in charge to alert them.

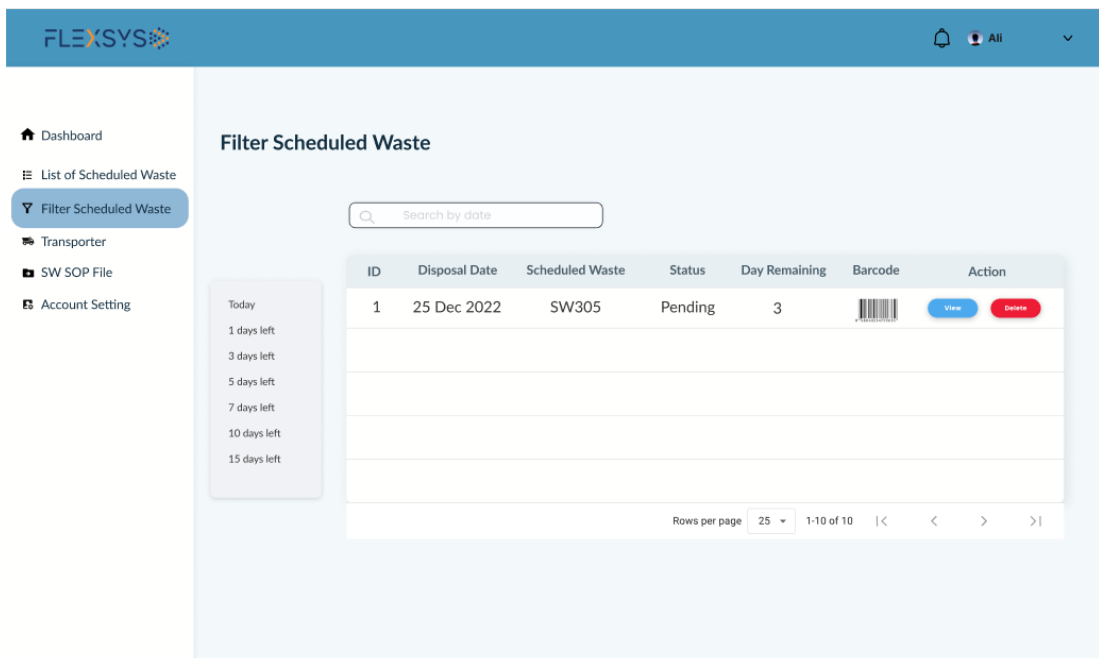


Figure 3.22 Manager-Filter Scheduled Waste

Figure 3.23 shows the dashboard page for the admin. For admin view, it will display the total users, total employees and also the total manager that the admin has been registered. The page also shows the summary in percentage of total scheduled waste that has been disposed.

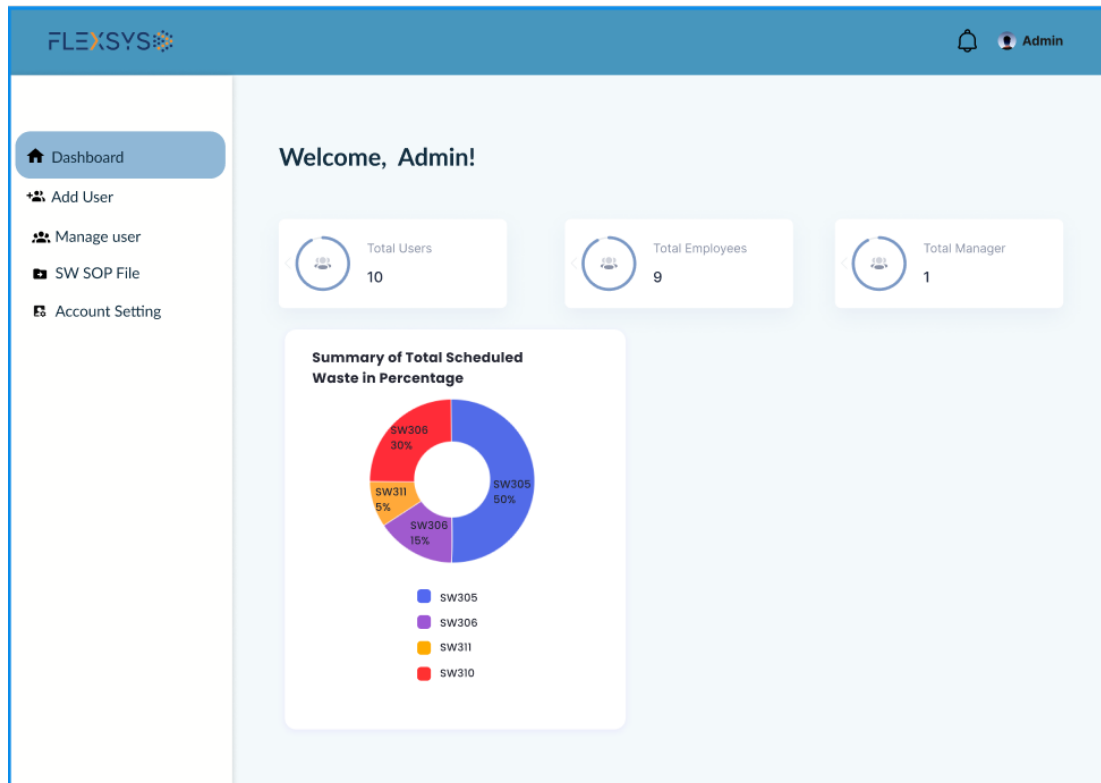


Figure 3.23 Admin-Dashboard

Besides, the Admin also allowed to view the lists of file that has been uploaded by the manager in order to control the content of the uploaded file. Admin is allowed to view and delete the files.



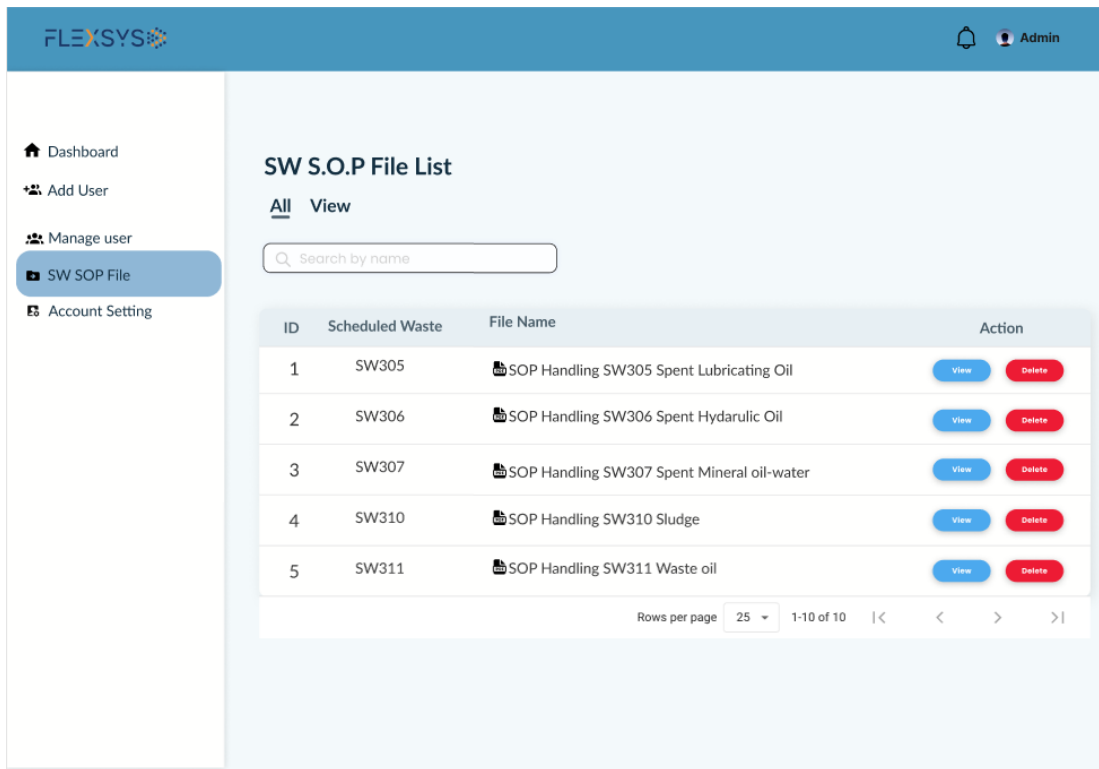


Figure 3.24 Admin-SOP Files

### 3.5 Data Design

Data design will be discussed on Entity Relationship Diagram (ERD) and including data dictionary.

#### 3.5.1 Entity Relationship Diagram

Figure 3.37 shows the ERD for Scheduled Waste Inventory and Monitoring system. The database for the system include seven tables which are scheduledwaste, attendance, users, receiver, transporter, document.

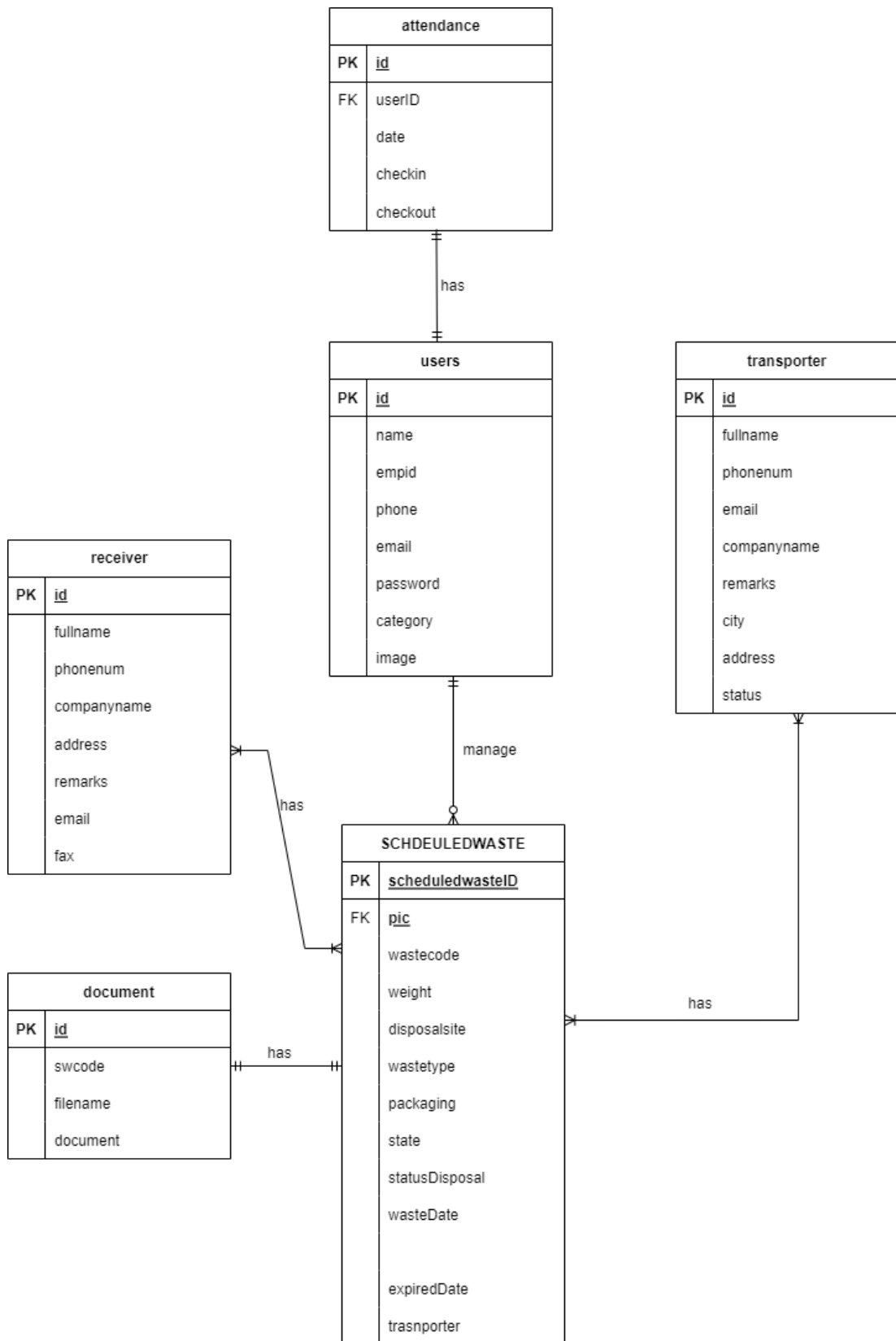


Figure 3.37 ERD for Scheduled Waste Inventory and Monitoring system

### 3.5.2 Data Dictionary

Entity	Attribute	Data Type	Key
user	id	INT	Primary Key
	name	VARCHAR (255)	
	empid	INT (12)	
	phone	VARCHAR (255)	
	email	VARCHAR (10)	
	password	VARCHAR (30)	
	category	VARCHAR (20)	
	image	VARCHAR (30)	
transporter	id	INT	Primary Key
	fullname	VARCHAR (255)	
	phonenum	INT (12)	
	email	VARCHAR (255)	
	companyname	VARCHAR (255)	
	remarks	VARCHAR (20)	
	city	VARCHAR (20)	
	address	VARCHAR (255)	
scheduledwaste	id	INT	Primary Key
	userID	INT	Foreign Key
	wastecode	VARCHAR (20)	
	weight	VARCHAR (255)	
	disposalsite	VARCHAR (255)	
	wastetype	VARCHAR (255)	
	packaging	VARCHAR (50)	
	state	VARCHAR (50)	
	statusDisposal	VARCHAR (50)	
	wasteDate	DATE	
	pic	INT	
	expiredDate	DATE	
	transporter	VARCHAR (50)	
document	id	INT	Primary Key
	swcode	VARCHAR (50)	
	filename	VARCHAR (255)	

	document	VARCHAR (255)	
attendance	id	INT	Primary Key
	userID	INT	Foreign Key
	date	DATE	
	checkin	TIME	
	checkout	TIME	
receiver	id	INT	Primary Key
	fullname	VARCHAR (50)	
	phonenum	INT (12)	
	companyname	VARCHAR (255)	
	address	VARCHAR (255)	
	remarks	VARCHAR (255)	
	email	VARCHAR (255)	
	fax	INT (12)	

### 3.6 Testing/Validation Plan

The Scheduled Waste Inventory and Monitoring system will include two testing plan which user acceptance test and usability test.

#### 3.6.1 User Acceptance Testing

User acceptance testing is being created to performed the last test with the end user. It is to ensure the system meets the requirement and the client business.

Module	Activities	Status		Comment
		Yes	No	
Registration	Create New User			
Manage Profile	Update profile information			
Manage Scheduled Waste	Add Scheduled Waste			
	Retrieve Scheduled Waste List			
	Update Scheduled Waste			
	Delete Scheduled Waste			
	Barcode generated			

	List of Scheduled Waste in Calendar			
Manage Transporter	Add Transporter			
	Retrieve Transporter			
	Update Transporter			
	Delete Transporter			
Manage Receiver	Add Receiver			
	Retrieve Receiver			
	Update Receiver			
	Delete Receiver			
Manage Notification	Send Email Notification (Manager)			
	Retrieve Email Notification (Employee)			
Manage Attendance	Record Check-in			
	Record Check-out			
	Retrieve Attendance			
Manage File to Handle Scheduled Waste(Admin, Manager)	Add file			
	Update file			
	Delete file			
	Retrieve file			

### 3.6.2 Usability Test

Usability test is created to evaluate the efficiency of the system. This includes all the possible scenarios that might occur.

No.	Activities	Strongly Agree					Strongly Disagree	N/A
		1	2	3	4	5		
1	Satisfied with the efficiency of the system							

2	It is user friendly system						
3	Easy to understand the system						
4	The interface of this system is simple and easy to understand						
5	I feel comfortable to use the system						
6	Easy to find the information needed						
7	The system shows error message and explain what to do						
8	Information is organize clearly on the screen						
9	This system has all the functions and capabilities that meet my expectations						

### 3.7 Potential Use of Solution

The Scheduled Waste Inventory and Monitoring system to be used in the industrial field such as Flexsys Chemical (M) Sdn. Bhd since the proposed system has been developed particularly for the staff to utilised the system in that company. This will ease the staff to keep track of their disposal of scheduled waste without missing

the important date. There are a few potential uses of the Scheduled Waste Inventory and Monitoring system brought to the Flexsys Chemical (M) Sdn. Bhd.

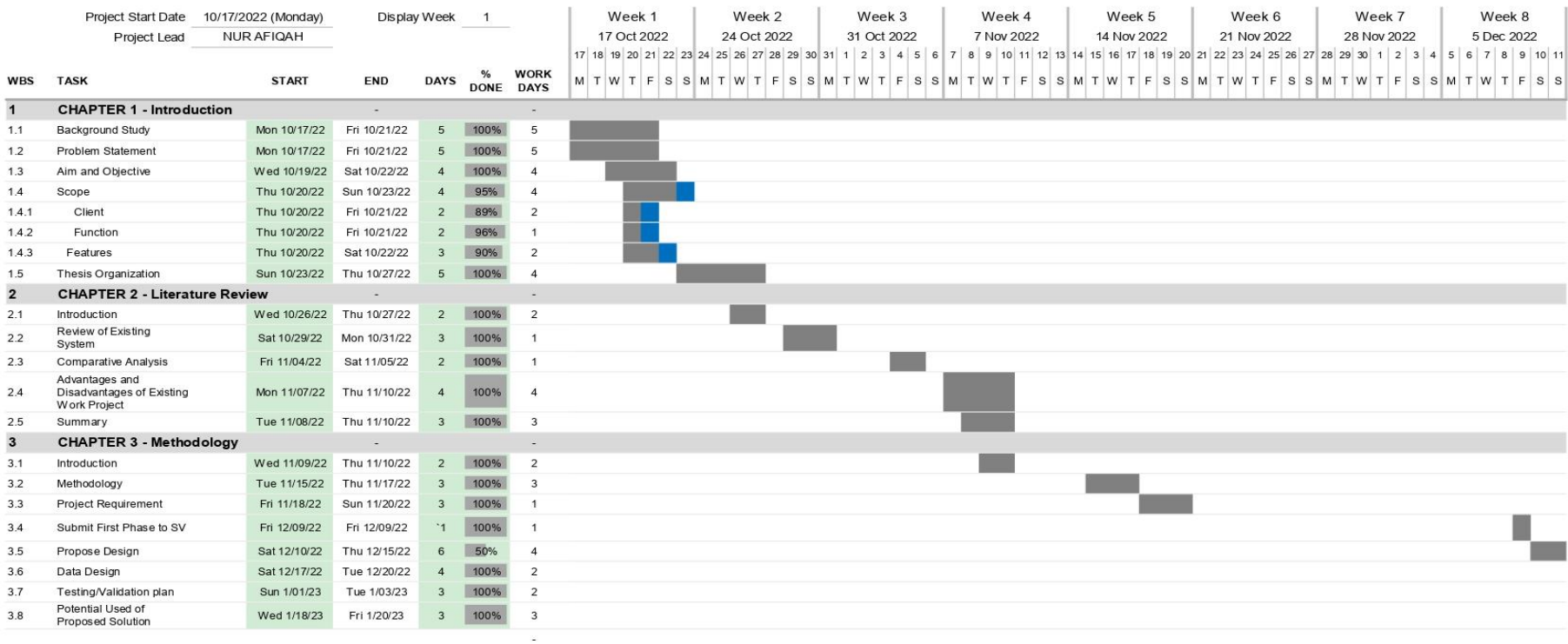
One of the potential uses is that the system will be very convenient for the Employee and Manager. This is because the information is kept online and not manually. If the scheduled waste list is still manually recorded on a paper it will be inconvenient because the staff might have lost the book or misplaced the book somewhere else. Indirectly, this will affect the other staff too as it was recorded in the same book. Hence, by using the proposed system it will ease the staff in order to have access to the details regarding the scheduled waste list that need to be disposed.

Besides, the system allows the manager to keep monitoring the disposal of scheduled waste by using the filtering features in the proposed system. For example, The manager filters the scheduled waste that need to be disposed within 3 days, so the system will display the lists of scheduled waste that need to be disposed in 3 days more. Apart from that, the proposed system has implemented the alert notification to the users. For instance, if the scheduled waste is being stored for more than 180 days, it will alert the users by using an email or push notification through the system to the employee page. The system also allows the manager to send the reminder to the individual in charge a few days before the date that scheduled waste should be disposed. If it is stored more than certain days, it will also alert the individual in charge. In addition, the Scheduled Waste Inventory and Monitoring system will have a calendar that specifically pin the date of scheduled waste that needs to be disposed and the person in charge. In a nutshell, the Scheduled Waste Inventory and Monitoring system will comes in handy to the staff to keep their information and monitor it efficiently and faster.

### 3.8 Gantt Chart

#### SCHEDULED WASTE INVENTORY AND MONITORING SYSE

PROJECT UNDERGRADUATE 1





## **CHAPTER 4**

### **RESULT AND DISCUSSION**

#### **4.1 INTRODUCTION**

This chapter will discuss implementation of the Scheduled Waste Inventory and Monitoring system including the result. In this chapter, it provides the interfaces, User Acceptance Test and all the requirements including the hardware and software are used to develop the complete system.

#### **4.2 SYSTEM IMPLEMENTATION PROCESS**

Scheduled Waste Inventory and Monitoring system use the Visual Studio Code to develop the system. This project use Laravel Framework to connect with the database. HyperText Markup language (HTML) also being used to develop this project. To design the system cascading style sheets (CSS) is used to design the interface of the system.

#### **4.3 INPUT AND OUTPUT DESIGN**

Figure 4.1 shows the page of where the user's employee category needs to fill in the information of the scheduled waste that needs to be queued for the disposing process. In choosing the transporter, the user will see the list of transporters that retrieved from the database. The transporter information will be inserted by the other user's category which is the Manager.

The screenshot shows the 'Scheduled Waste' form in the SWIM system. The form is titled 'Add New Waste' and contains the following fields:

- WASTE CODE: SW \*\*\*
- WEIGHT (mt): Weight
- WASTE DESCRIPTION: Waste Description
- DISPOSAL SITE: Disposal Site
- WASTE TYPE: Waste type
- TYPE OF PACKAGING: TYPE OF PACKAGING
- PHYSICAL STATE: PHYSICAL STATE
- DISPOSAL STATUS: DISPOSAL STATUS
- WASTE GENERATED DATE: dd/mm/yyyy
- PERSON IN CHARGE: Person in Charge Name
- WASTE EXPIRED DATE: dd/mm/yyyy
- TRANSPORTER: akif

A 'Submit' button is located at the bottom right of the form.

Figure 4.1 Scheduled Waste Form (Input)

Figure 4.2 shows the output after the user submits the form as shown in figure 4.1. However, to edit the form, users need to click on Edit button otherwise editing the form will be impossible for the users.

The screenshot shows the 'Scheduled Waste' form in the SWIM system, displaying the submitted data. The form is titled 'Display Scheduled Waste' and contains the following fields:

- WASTE CODE: SW 103
- WEIGHT (mt): 12
- WASTE DESCRIPTION: Waste containing arsenic or its compound
- DISPOSAL SITE: Jabor
- WASTE TYPE: non-Flammable
- TYPE OF PACKAGING: JumboBag
- PHYSICAL STATE: Solid
- DISPOSAL STATUS: Disposed
- WASTE GENERATED DATE: 13/04/2023
- PERSON IN CHARGE: akif
- WASTE EXPIRED DATE: 03/06/2023
- TRANSPORTER: danish

An 'Edit' button is located at the bottom right of the form.

Figure 4.2 Scheduled Waste Form (Output)

As shown in figure 4.3, it is the code for creating the form for figure 4.1. Meanwhile figure 4.4 shows the code for the output page. The code for both pages are the same but in order to retrieve the data to be displayed in the output page, the code `{{ $data->variable }}` is used. Hence, it will show as figure 4.2.

```

17 <!-- form add waste -->
18 <form method="POST" action="{ route('insertnewwaste') }" id="wasteform">
19 @csrf
20 <div class="row">
21 <div class="col">
22 <div class="row">
23 <div class="col">
24 <div class="col">
25 <label>WASTE CODE</label>
26 <input type="text" name="wastecode" class="form-control" placeholder="SW ***" required>
27 </div>
28 </div>
29 <div class="col">
30 <label>WEIGHT (mt)</label>
31 <input type="number" name="weight" class="form-control" placeholder="Weight" required>
32 </div>
33 </div>
34 <br>
35 <div class="row">
36 <div class="col">
37 <div class="col">
38 <label>WASTE DESCRIPTION</label>
39 <input type="text" name="wastedescription" class="form-control" placeholder="Waste Description" r
40 </div>
41 </div>
42 <div class="col">
43 <label>DISPOSAL SITE</label>
44 <input type="text" name="disposalsite" class="form-control" placeholder="Disposal Site" required>

```

Figure 4.3 Snippet Code of Scheduled Waste Form (input)

```

resources > views > scheduledwaste > editwaste.blade.php
16 m method="POST" action="{ route('updatedwaste', $data->id) }" id="wasterform">
19 f
20 @method('PUT')
21 <div class="row">
22 <div class="col">
23 <div class="row">
24 <div class="col">
25 <div class="col">
26 <label>WASTE CODE</label>
27 <input type="text" name="wastecode" class="form-control" value="{{ $data->wastecode }}" required>
28 </div>
29 </div>
30 <div class="col">
31 <label>WEIGHT (mt)</label>
32 <input type="number" name="weight" class="form-control" value="{{ $data->weight }}" required>
33 </div>
34 </div>
35 <br>
36 <div class="row">
37 <div class="col">
38 <div class="col">
39 <label>WASTE DESCRIPTION</label>
40 <input type="text" name="wastedescription" class="form-control" value="{{ $data->wastedescription }}" r
41 </div>
42 </div>
43 <div class="col">
44 <label>DISPOSAL SITE</label>
45 <input type="text" name="disposalsite" class="form-control" value="{{ $data->disposalsite }}" required>

```

Figure 4.4 Snippet Code of Scheduled Waste Form (output)

#### 4.4 DATABASE IMPLEMENTATION

This section shows the database of the Scheduled Waste Inventory and Monitoring system named 'swim' which used MySQL. Figure 4.5 shows the list of tables that have been created for the system in completing the system.

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> failed_jobs	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	32.0 KiB	-
<input type="checkbox"/> migrations	★ Browse Structure Search Insert Empty Drop	7	InnoDB	utf8mb4_unicode_ci	16.0 KiB	-
<input type="checkbox"/> password_resets	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	32.0 KiB	-
<input type="checkbox"/> password_reset_tokens	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	16.0 KiB	-
<input type="checkbox"/> personal_access_tokens	★ Browse Structure Search Insert Empty Drop	0	InnoDB	utf8mb4_unicode_ci	48.0 KiB	-
<input type="checkbox"/> scheduledwaste	★ Browse Structure Search Insert Empty Drop	2	InnoDB	utf8mb4_unicode_ci	16.0 KiB	-
<input type="checkbox"/> transporter	★ Browse Structure Search Insert Empty Drop	3	InnoDB	utf8mb4_unicode_ci	16.0 KiB	-
<input type="checkbox"/> users	★ Browse Structure Search Insert Empty Drop	2	InnoDB	utf8mb4_unicode_ci	32.0 KiB	-
<b>8 tables</b>	<b>Sum</b>	<b>14</b>	<b>InnoDB</b>	<b>utf8mb4_general_ci</b>	<b>208.0 KiB</b>	<b>0 B</b>

Figure 4.5 List of Tables

Figure 4.6 shows the table named users. This is the table to store all the information about the users during the registration process. If the users update their information, this table also will update the data accordingly as the users. There are few attributes for the Users Table which are UserID as primary key, name, empid, phone, email, password, category and image.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/> 1	id	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
<input type="checkbox"/> 2	name	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
<input type="checkbox"/> 3	empid	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
<input type="checkbox"/> 4	phone	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
<input type="checkbox"/> 5	email	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
<input type="checkbox"/> 6	email_verified_at	timestamp			Yes	NULL			Change Drop More
<input type="checkbox"/> 7	password	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
<input type="checkbox"/> 8	category	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
<input type="checkbox"/> 9	image	varchar(255)	utf8mb4_unicode_ci		Yes	NULL			Change Drop More
<input type="checkbox"/> 10	remember_token	varchar(100)	utf8mb4_unicode_ci		Yes	NULL			Change Drop More
<input type="checkbox"/> 11	created_at	timestamp			Yes	NULL			Change Drop More
<input type="checkbox"/> 12	updated_at	timestamp			Yes	NULL			Change Drop More

Figure 4.6 Users Table

Meanwhile, figure 4.7 shows the attributes of the transporter information. The attributes for the transportation table are transporterID as primary key, fullname, phonenum, email, address, gender, platenumber, city and status.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	<b>id</b>	bigint(20)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	<b>fullname</b>	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
3	<b>phonenum</b>	bigint(20)			No	None			Change Drop More
4	<b>email</b>	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
5	<b>address</b>	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
6	<b>gender</b>	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
7	<b>platenumber</b>	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
8	<b>city</b>	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
9	<b>status</b>	varchar(255)	utf8mb4_unicode_ci		No	None			Change Drop More
10	<b>created_at</b>	timestamp			Yes	NULL			Change Drop More
11	<b>updated_at</b>	timestamp			Yes	NULL			Change Drop More

Figure 4.7 Transporter table

Figure 4.8 shows the attributes of scheduled waste information. scheduledwasteID as the primary key and transporterID as the foreign key. transporterID is used as foreign key because the information of the transporter will also be used to complete the scheduled waste form.

ID	Column Name	Field Type	Collation	is nullable	is unsigned	Actions
2	wastecode	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
3	weight	bigint(20)		No	None	Change Drop More
4	wastedescription	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
5	disposalsite	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
6	wastetype	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
7	packaging	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
8	state	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
9	statusDisposal	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
10	wasteDate	date		No	None	Change Drop More
11	pic	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More
12	expiredDate	date		No	None	Change Drop More
	transporter	varchar(255)	utf8mb4_unicode_ci	No	None	Change Drop More

Figure 4.8 Scheduled Waste Table

## 4.5 CODE IMPLEMENTATION

This section will discuss the coding implementation which create, retrieve, update and delete (CRUD).

Figure 4.9 shows the function that handles a POST request to insert a new record into the "scheduledwaste" table of a database. It takes a Request object as a parameter, which contains the data submitted through the HTTP request. First retrieves the ID of the authenticated user using the Auth::user() method. Then it uses the \$request object to retrieve the input values of various fields such as "wastecode", "weight", "wastedescription", "disposalsite", "wastetype", "packaging", "state", "statusDisposal", "wasteDate", "pic", "expiredDate", and "transporter" from the submitted form. It stores all the retrieved input data in an associative array called \$data. Then uses the DB::table method to create a query builder instance for the "scheduledwaste" table and uses the "insert" method to insert the \$data array as a new record into the table. Finally, it redirects the user to the "swlist" route.

```

public function insertnewwaste(Request $request)
{
    // get user auth
    $id = Auth::user()->id;
    $wastecode = $request->input('wastecode');
    $weight = $request->input('weight');
    $wastedescription = $request->input('wastedescription');
    $disposalsite = $request->input('disposalsite');
    $wastetype = $request->input('wastetype');
    $packaging = $request->input('packaging');
    $state = $request->input('state');
    $statusDisposal = $request->input('statusDisposal');
    $wasteDate = $request->input('wasteDate');
    $pic = $request->input('pic');
    $expiredDate = $request->input('expiredDate');
    $transporter = $request->input('transporter');
}

```

Figure 4.9 insertnewwaste

Figure 4.10 shows the function that handles a GET request to display information about a particular record from two database tables: "scheduledwaste" and "transporter". It takes two parameters which are a Request object and an ID of the record to be displayed. First, it uses the DB::table method to create a query builder instance for the "scheduledwaste" table and uses the "where" method to filter the records to only the one with the given ID. Then uses the "get" method to retrieve the filtered record(s) and assigns the result to the \$wastelist variable. It repeats the above process for the "transporter" table, retrieving the record(s) with the same ID and assigning the result to the \$transporterlist variable. Finally, it will pass both \$wastelist and \$transporterlist variables to the "displaywaste" view template using the "compact" function, which creates an associative array with variable names as keys and their values as values.

```

public function displaywaste(Request $request, $id)
{
    $wastelist = DB::table('scheduledwaste')
    ->where('id',$id)
    ->get();

    $transporterlist = DB::table('transporter')
    ->where('id',$id)
    ->get();

    return view('scheduledwaste.displaywaste', compact('wastelist','transporterlist'));
}

```

Figure 4.10 displaywaste

Figure 4.11 shows the function that handles a request to update a record in a database table named "scheduledwaste". The function takes two parameter which are a request object that contains the updated data, and the ID of the record to be updated. The function first uses the "find" method to retrieve the record from the database with the specified ID. After updating the record, the function uses the "update" method to save the changes to the database. Finally, it redirects the user back to the previous page with a success message displayed in a message box.

```

public function UpdatedWaste(Request $request, $id)
{
    // find the id from proposal
    $wastelist = scheduledwaste::find($id);

    $wastelist->wastecode = $request->input('wastecode');
    $wastelist->weight = $request->input('weight');
    $wastelist->wastedescription = $request->input('wastedescription');
    $wastelist->disposalsite = $request->input('disposalsite');
    $wastelist->wastetype = $request->input('wastetype');
    $wastelist->packaging = $request->input('packaging');
    $wastelist->state = $request->input('state');
    $wastelist->statusDisposal = $request->input('statusDisposal');
    $wastelist->wasteDate = $request->input('wasteDate');
    $wastelist->pic = $request->input('pic');
    $wastelist->expiredDate = $request->input('expiredDate');
    $wastelist->transporter = $request->input('transporter');

    // update query in the database
    $wastelist->update();

    // display message box in the same page
    return redirect()->back()->with('message', 'Product Updated Successfully');
}

```

Figure 4.11 UpdatedWaste



Figure 4.12 shows the function that handles a DELETE request to delete a record from a database table named "scheduledwaste". It takes two parameters which are Request object and an ID of the record to be deleted. First, uses the "find" method of the "scheduledwaste" model to retrieve the record with the given ID from the database and assigns it to the \$wastelist variable. Then uses the DB::delete method to delete the record from the "scheduledwaste" table where the ID matches the given ID. After the deletion, it displays a success message and redirects the user back to the previous page with a message indicating that the waste was deleted successfully.

```
public function deletewaste(Request $request, $id)
{
    // find proposal id
    $wastelist = scheduledwaste::find($id);

    // delete the record from the database
    DB::delete('DELETE FROM scheduledwaste WHERE id = ?', [$id]);

    echo "Record deleted successfully.<br/>";
    return redirect()->back()->with('message', 'Waste Deleted Successfully');
}
```

Figure 4.12 deletewaste

## 4.6 USER MANNUAL

This section will explain the interfaces for each module with the details.

Figure 4.13 shows the login page after the users complete with the registration. User need to fill in the registered email address and also the password. If the users do not have the account, user can click on the Register link below the login form.

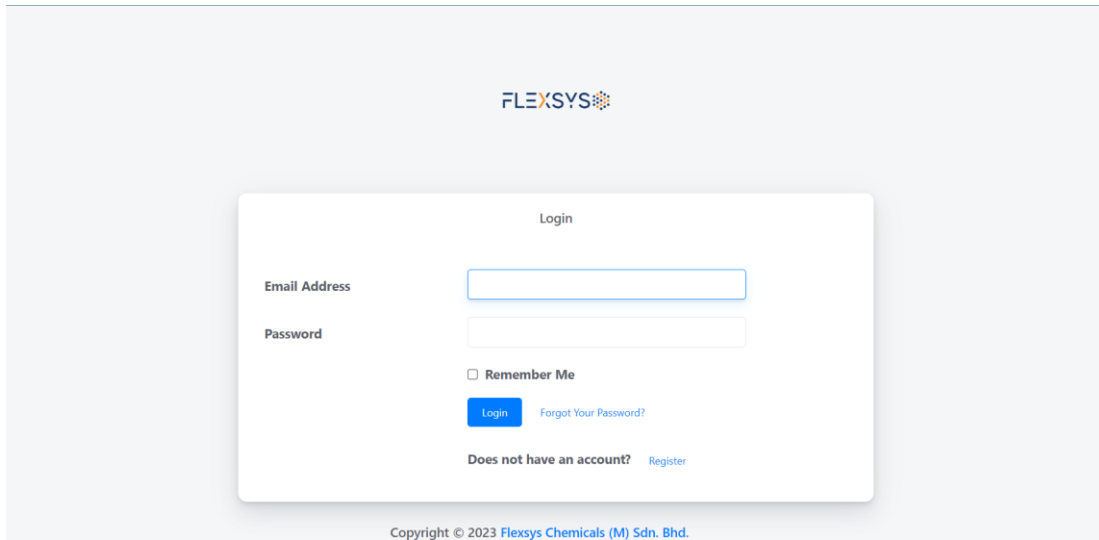


Figure 4.13 Login Page

Figure 4.14 shows the registration page before the users have the access to the Scheduled Waste Inventory and Monitoring system. Users need to fill in all the information which are name, employee ID, phone number, email, password and user type. If the users do not fill in all the required field, the registration process will not be process.

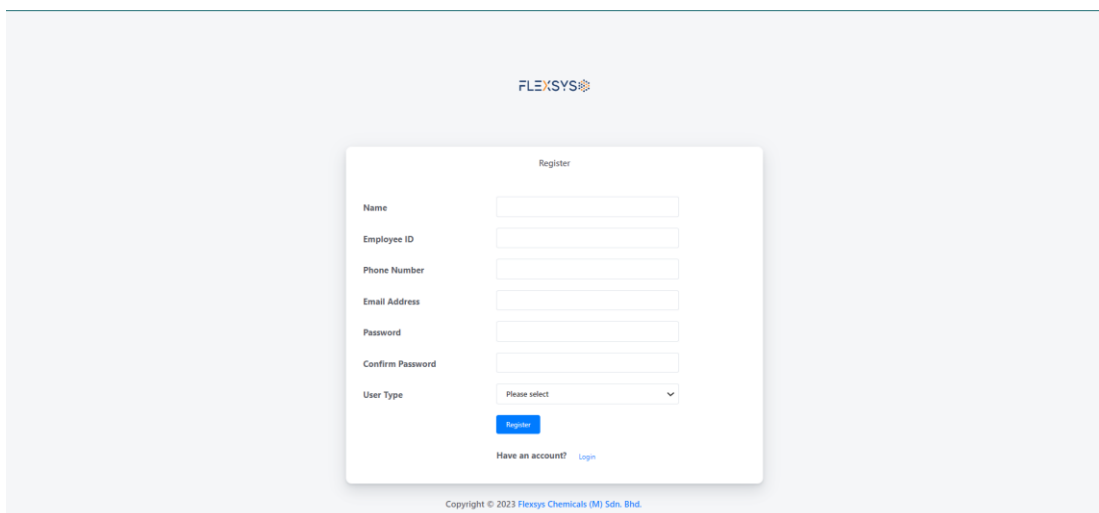


Figure 4.14 Register Page

Figure 4.15 shows the list of all the inserted scheduled waste. All list of the scheduled waste be displayed in this page after the manager and employee successful fill in the form. This page will display only few important information that need to be alert such as the disposal date, scheduled waste code, status, days remaining and also the person

in charge. Besides, all the users such as admin, manager and employee will have the same view for the list of scheduled waste.

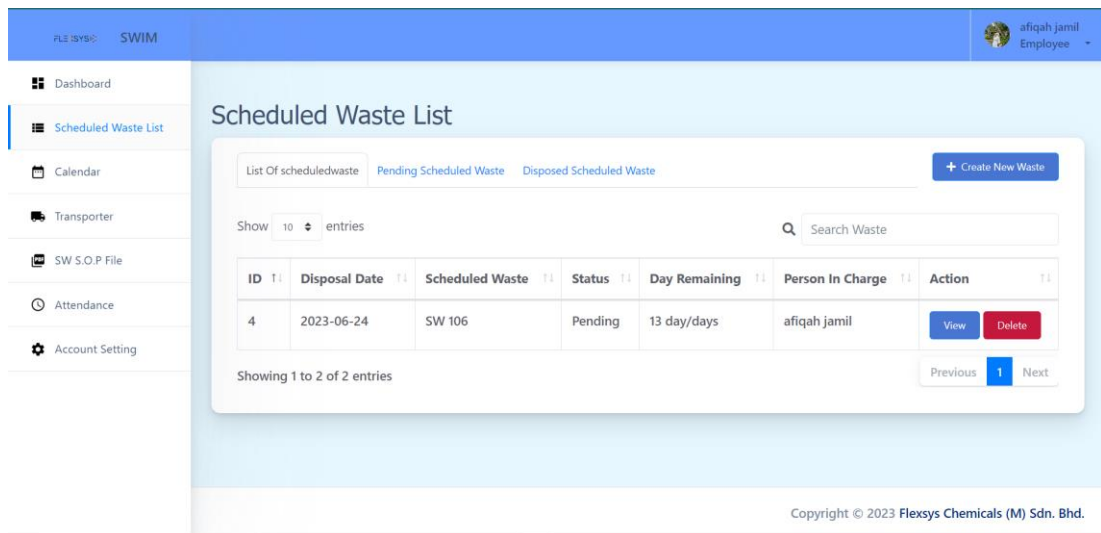


Figure 4.15 List of Scheduled Waste Page

Figure 4.16 shows the page for users to fill in all the required information for the scheduled waste disposal. All the field must be fill such as waste code, waste description, waste type, physical state, generated and disposal date, weight, disposal site, type of packaging, disposal status, person in charge and transporter.

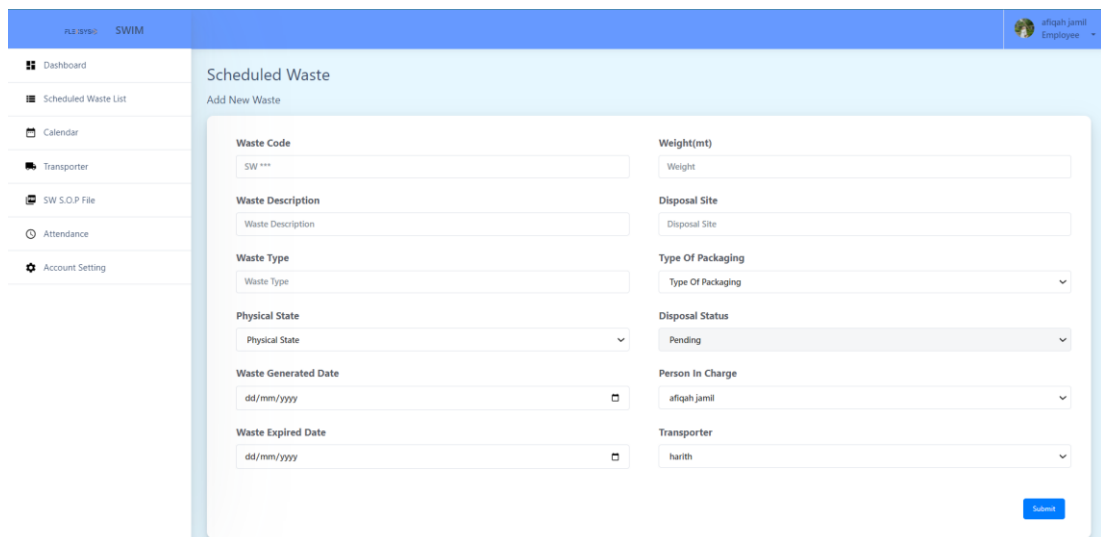


Figure 4.16 Add New Scheduled Waste Page

Figure 4.17 shows the display page after the users click on view button on the List of Scheduled Waste Page. This page will retrieve all the submitted data into the database during fill in the scheduled waste form. If the users do not click on the edit button, the users are not able edit the information

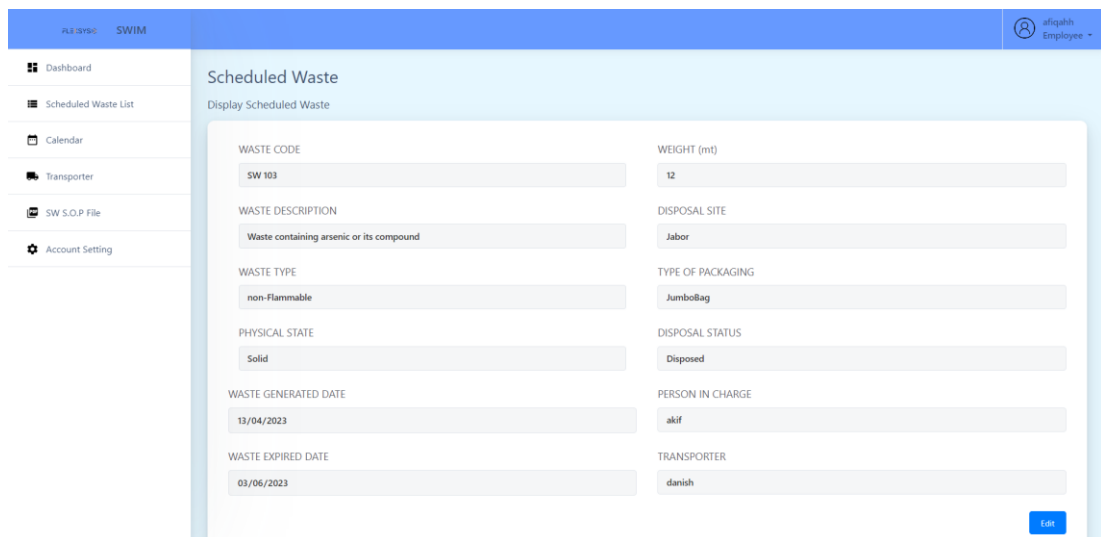


Figure 4.17 Display Data of Scheduled Waste Page

Figure 4.18 shows the confirmation message box for the update. This is because if the users accidentally update a wrong information, users just click on the ‘No, Cancel’ button and the users are confirming to update the inserted information just click on the ‘Yes, update it’ button.

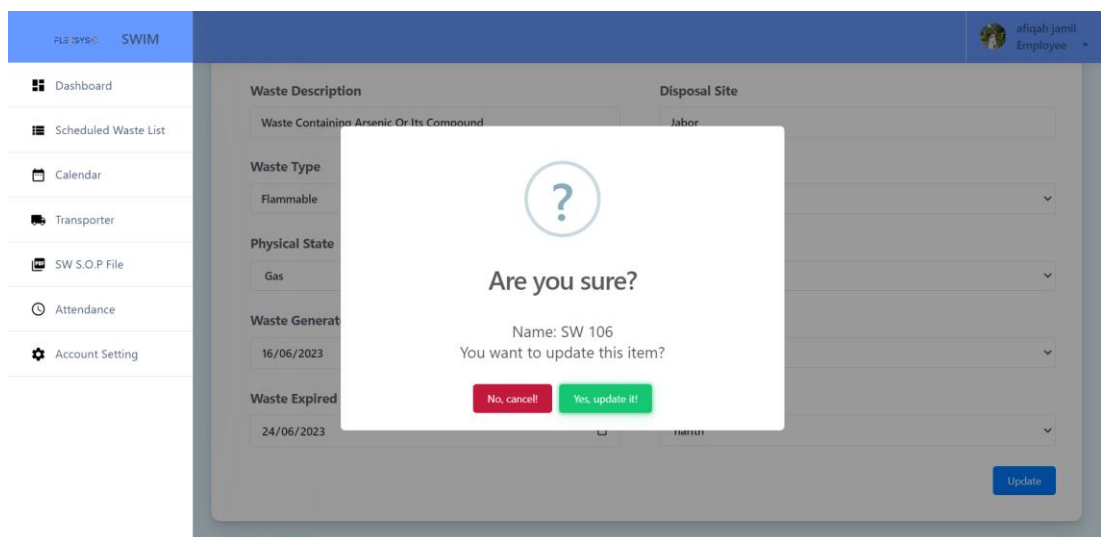


Figure 4.18 Confirmation Page for Update

Figure 4.19 shows the confirmation message box for the delete. This is because if the users accidentally click on the delete button, it will not instantly delete the information. Users are able to revert it by click on the ‘No, Cancel’ button or click on ‘Yes, delete it’ button. The message box will display the scheduled waste code.

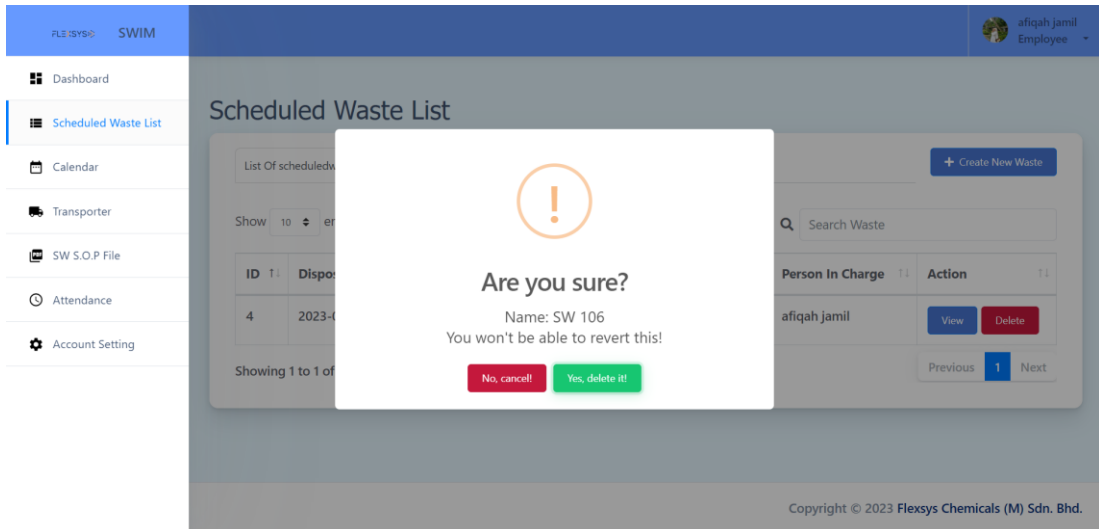


Figure 4.19 Confirmation Page for Delete

Figure 4.20 shows the calendar page where all the scheduled waste that has been inserted will be displayed in the calendar. The user is also able to click on the scheduled waste in the calendar and it will redirect to the page where it displays all the information about the scheduled waste as shown in figure 4.17

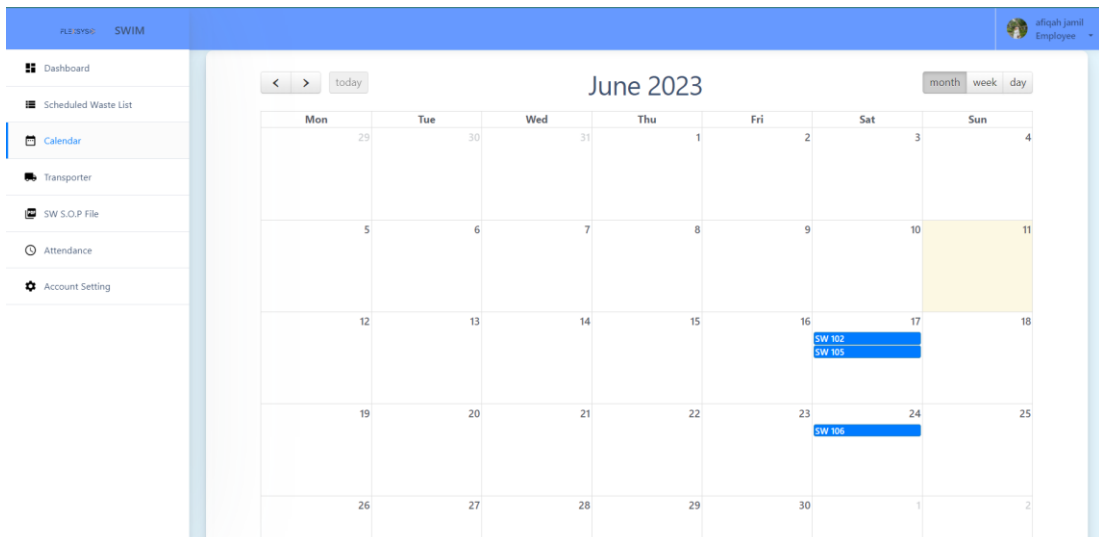


Figure 4.20 Calendar

Figure 4.21 shows the attendance page where all users must fill in. Users just need to click on the Check-in button and the system will record it inside the table. Once the user clicks on the Check-in button in a day, the button will turn to disable.

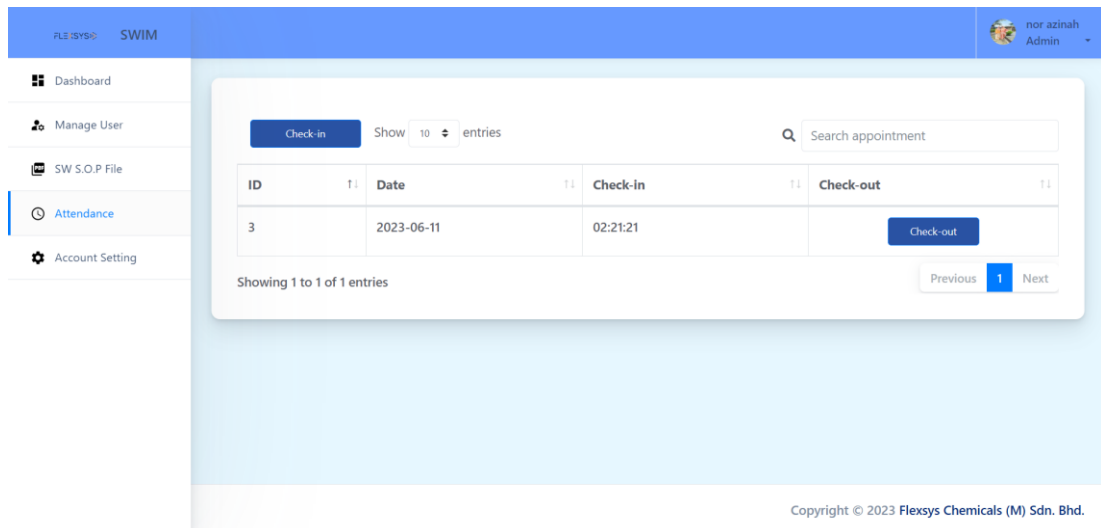


Figure 4.21 Attendance for Check-in

Figure 4.22 shows the attendance page just the same as figure 4.21. But figure below is specifically for checkout session. Users need to click on the Check-out button after finish 8 hours of working. The check-out time will be displayed in the table and the button will disappear. If the user do not click on the Check-out button, the button will remain in the row.

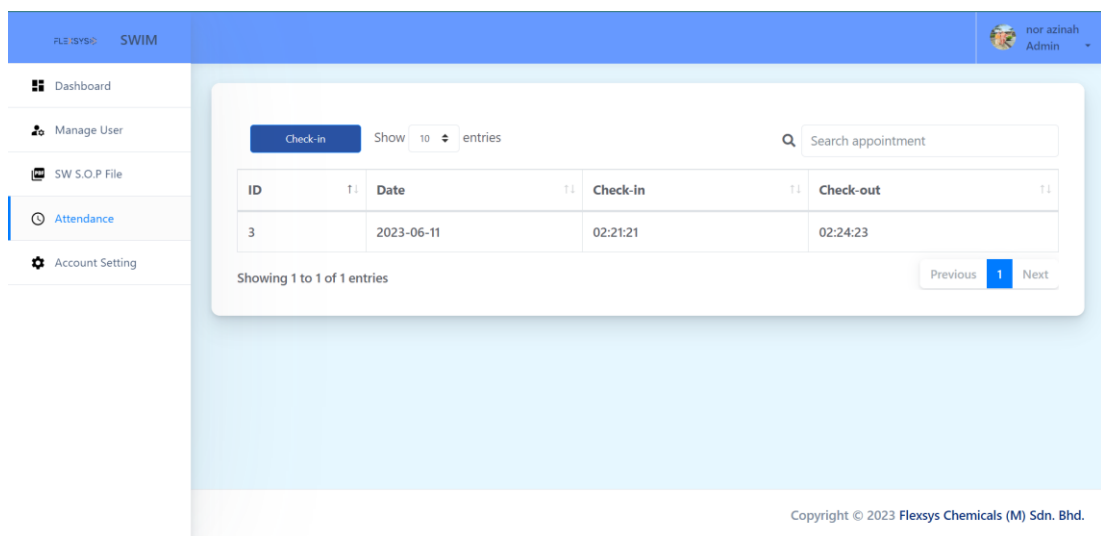


Figure 4.22 Attendance for Check-out

Figure 4.23 shows the account setting for the users. All the users can manage their information and also the profile picture. Users are allowed to update their, name, phone number, email, profile picture and also change the password.

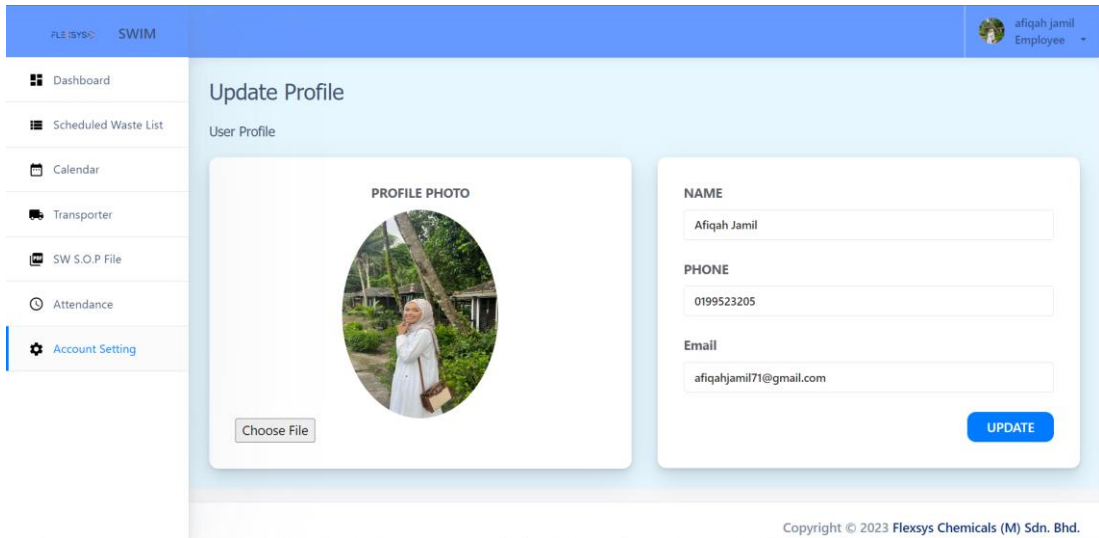


Figure 4.23 Account Setting Page

Figure 4.24 shows the page of user (manager) where it displays all scheduled created by the user (employee). The Disposal Date will turn into red color to indicate that the waste need to be disposed within five days. This will alert the employee about the disposal waste. Manager also can send email alert notification to the person in charge of the waste by click on the Email button.

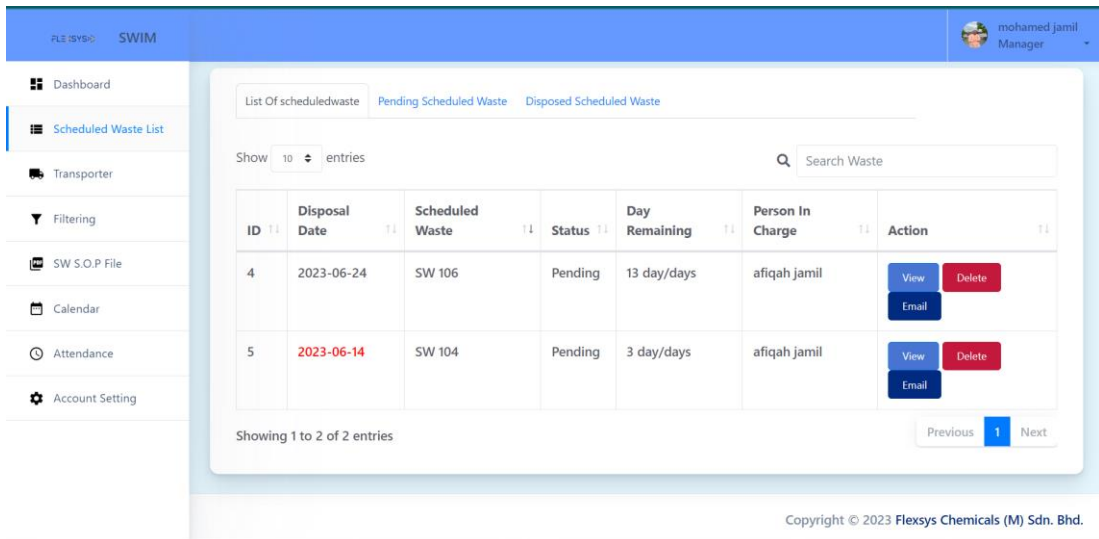


Figure 4.24 Send Email

Figure 4.25 shows the example of message in the email that has been sent by the manager. This is message will alert the employee to take urgent action regarding the scheduled waste.

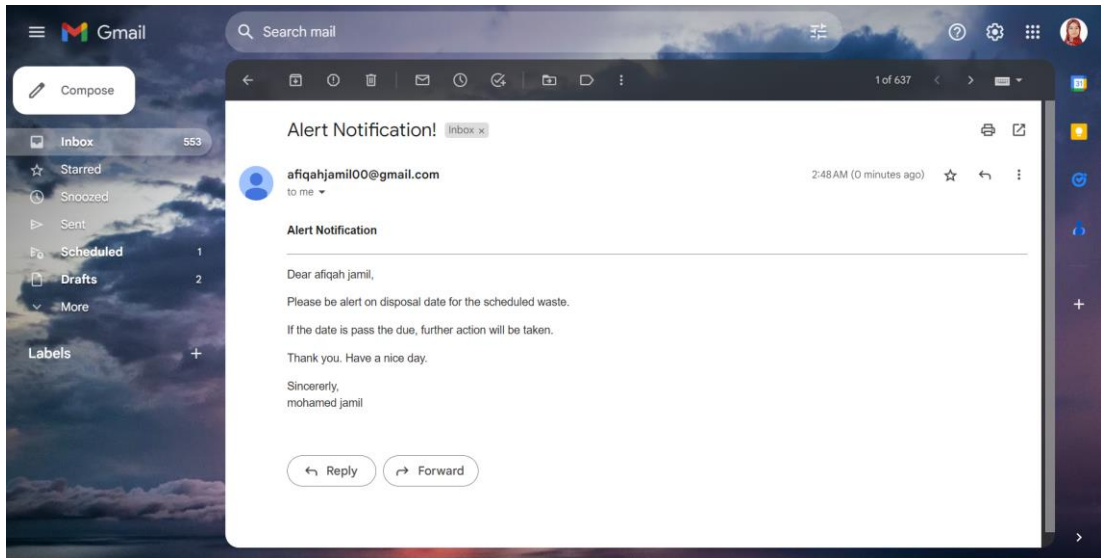


Figure 4.25 Email Notification

Figure 4.26 shows the list of all the inserted transporter. All list of the transporter be displayed in this page after the manager successful fill in the form. This page will display only few important information such as the fullname, city, vehicle plate, phone number and also status. Besides, all the users such as admin, manager and employee will have the same view for the list of scheduled waste.

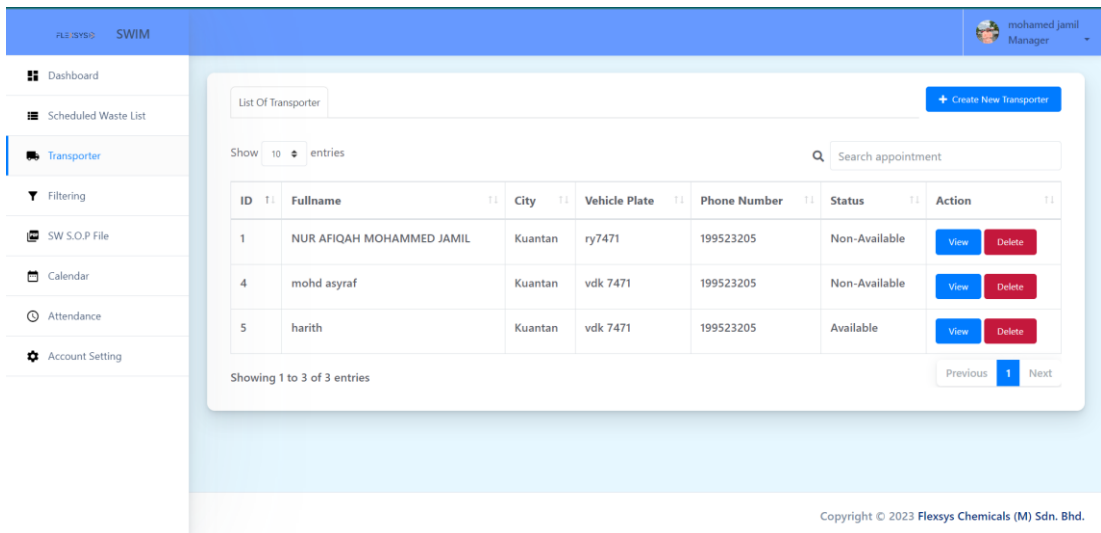


Figure 4.26 List of Transporter

Figure 4.27 shows the page for users to fill in all the required information for the transporter data. All the field must be fill such as company name, address, city, remarks, fullname, email, phone number, registered vehicle plate and also status.



Figure 4.27 Add New Transporter

Figure 4.28 shows the page for manager to upload a document. All the users have the access to the documents. User need to click on Choose File button to choose document want to be uploaded and it will allow the preview of the document. Once the user clicks on submit button, it will redirect to the list of documents.

Figure 4.28 Add New SOP File Page

Figure 4.29 shows the list off all attendances for every employee. Only user which category manager is being able to view the attendance record. This is because it will ease the manager to supervise their supervisee. When the user click on 'View' button, it will display all the record of the attendances including the date, check-in and check-out time.

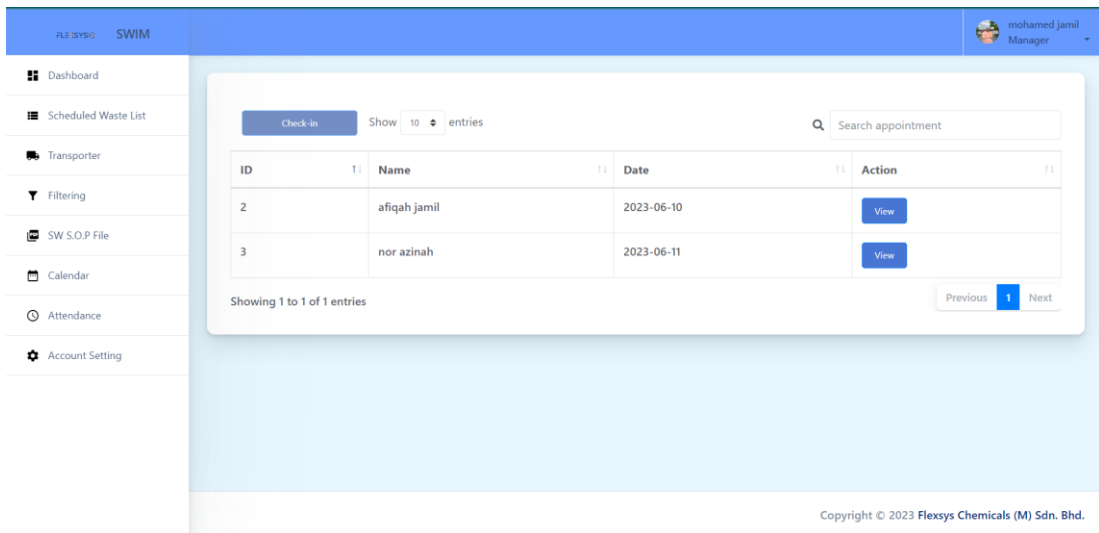


Figure 4.29 List of Attendances

Figure 4.30 shows the interface for List of Users for admin point of view. This page will display all registered users including their profile picture. Admin are able to view, edit and delete the data of the users. View button will redirect the admin to the display page of few more information of the users and able to edit the information

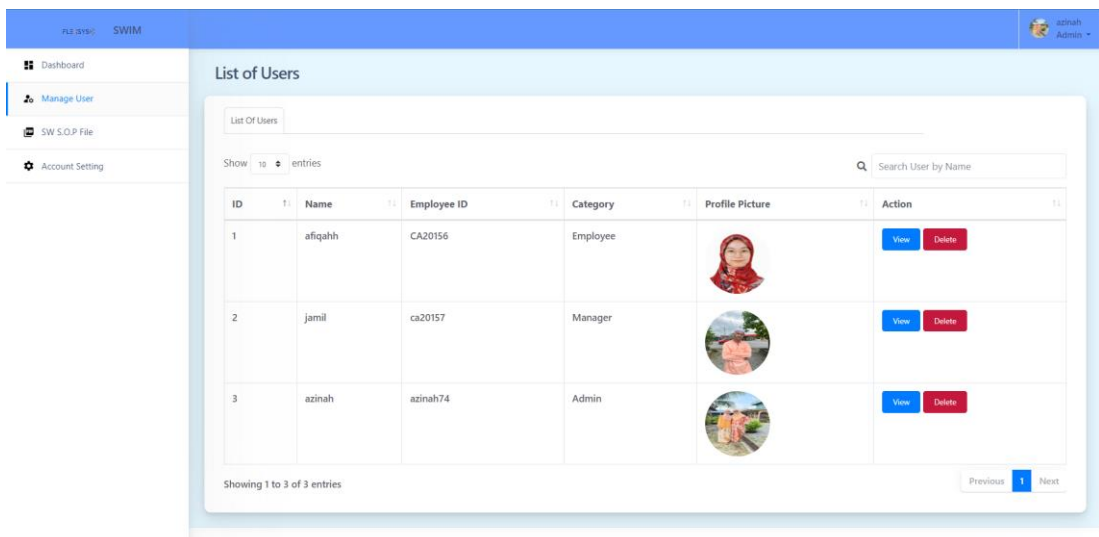


Figure 4.30 List of Users

## 4.7 USER ACCEPTANCE TESTING

User acceptance test is being created to performed the last test with the end user. It is to ensure the system meets the requirement and the client business.

Table 1: Respondent 1

Module	Activities	Status		Comment
		Yes	No	
Registration	Create New User	✓		
Manage Profile	Update profile information	✓		
Manage Scheduled Waste	Add Scheduled Waste	✓		
	Retrieve Scheduled Waste List	✓		
	Update Scheduled Waste	✓		
	Delete Scheduled Waste	✓		
	Barcode generated	✓		
	List of Scheduled Waste in Calendar	✓		
	Manage Transporter	Add Transporter	✓	
Retrieve Transporter		✓		
Update Transporter		✓		

	Delete Transporter	✓		
Manage Receiver	Add Receiver	✓		
	Retrieve Receiver	✓		
	Update Receiver	✓		
	Delete Receiver	✓		
Manage Notification	Send Email Notification (Manager)	✓		
	Retrieve Email Notification (Employee)	✓		
Manage Attendance	Record Check-in	✓		
	Record Check-out	✓		
	Retrieve Attendance	✓		
Manage File to Handle Scheduled Waste(Admin, Manager)	Add file	✓		
	Update file	✓		
	Delete file	✓		
	Retrieve file	✓		

This test has been performed by;

Name: Nur Alia Hidayah binti Rohaya Udin

Signature:



Date: 10 June 2023

Table 2: Respondent 2

Module	Activities	Status		Comment
		Yes	No	
Registration	Create New User	✓		
Manage Profile	Update profile information	✓		
Manage Scheduled Waste	Add Scheduled Waste	✓		
	Retrieve Scheduled Waste List	✓		
	Update Scheduled Waste	✓		
	Delete Scheduled Waste	✓		
	Barcode generated	✓		
	List of Scheduled Waste in Calendar	✓		
	Manage Transporter	Add Transporter	✓	
Retrieve Transporter		✓		
Update Transporter		✓		
Delete Transporter		✓		
Manage Receiver	Add Receiver	✓		
	Retrieve Receiver	✓		

	Update Receiver	✓		
	Delete Receiver	✓		
Manage Notification	Send Email Notification (Manager)	✓		
	Retrieve Email Notification (Employee)	✓		
Manage Attendance	Record Check-in	✓		
	Record Check-out	✓		
	Retrieve Attendance	✓		
Manage File to Handle Scheduled Waste(Admin, Manager)	Add file	✓		
	Update file	✓		
	Delete file	✓		
	Retrieve file	✓		

This test has been performed by;

Name: Nurain Aleeya binti Che Zaharudin

Signature:

*Aleeya*

Date: 10 June 2023

Table 3: Respondent 3

Module	Activities	Status		Comment
		Yes	No	
Registration	Create New User	✓		
Manage Profile	Update profile information	✓		
Manage Scheduled Waste	Add Scheduled Waste	✓		
	Retrieve Scheduled Waste List	✓		
	Update Scheduled Waste	✓		
	Delete Scheduled Waste	✓		
	Barcode generated	✓		
	List of Scheduled Waste in Calendar	✓		
Manage Transporter	Add Transporter	✓		
	Retrieve Transporter	✓		
	Update Transporter	✓		
	Delete Transporter	✓		
	Add Receiver	✓		

Manage Receiver	Retrieve Receiver	✓		
	Update Receiver	✓		
	Delete Receiver	✓		
Manage Notification	Send Email Notification (Manager)	✓		
	Retrieve Email Notification (Employee)	✓		
Manage Attendance	Record Check-in	✓		
	Record Check-out	✓		
	Retrieve Attendance	✓		
Manage File to Handle Scheduled Waste(Admin, Manager)	Add file	✓		
	Update file	✓		
	Delete file	✓		
	Retrieve file	✓		

This test has been performed by;

Name: Nurayuni binti Nordin Sin

Signature:



Date: 10 June 2023



Table 4: Respondent 4

Module	Activities	Status		Comment
		Yes	No	
Registration	Create New User	✓		
Manage Profile	Update profile information	✓		
Manage Scheduled Waste	Add Scheduled Waste	✓		
	Retrieve Scheduled Waste List	✓		
	Update Scheduled Waste	✓		
	Delete Scheduled Waste	✓		
	Barcode generated	✓		
	List of Scheduled Waste in Calendar	✓		
	Manage Transporter	Add Transporter	✓	
Retrieve Transporter		✓		
Update Transporter		✓		
Delete Transporter		✓		

Manage Receiver	Add Receiver	✓		
	Retrieve Receiver	✓		
	Update Receiver	✓		
	Delete Receiver	✓		
Manage Notification	Send Email Notification (Manager)	✓		
	Retrieve Email Notification (Employee)	✓		
Manage Attendance	Record Check-in	✓		
	Record Check-out	✓		
	Retrieve Attendance	✓		
Manage File to Handle Scheduled Waste(Admin, Manager)	Add file	✓		
	Update file	✓		
	Delete file	✓		
	Retrieve file	✓		

This test has been performed by;

Name: Nurin Azyyati binti Kamilizahri

Signature:



Date: 10 June 2023

Table 5: Respondent 5

Module	Activities	Status		Comment
		Yes	No	
Registration	Create New User	✓		
Manage Profile	Update profile information	✓		
Manage Scheduled Waste	Add Scheduled Waste	✓		
	Retrieve Scheduled Waste List	✓		
	Update Scheduled Waste	✓		
	Delete Scheduled Waste	✓		
	Barcode generated	✓		
	List of Scheduled Waste in Calendar	✓		
	Manage Transporter	Add Transporter	✓	
Retrieve Transporter		✓		
Update Transporter		✓		
Delete Transporter		✓		
Manage Receiver	Add Receiver	✓		
	Retrieve Receiver	✓		

	Update Receiver	✓		
	Delete Receiver	✓		
Manage Notification	Send Email Notification (Manager)	✓		
	Retrieve Email Notification (Employee)	✓		
Manage Attendance	Record Check-in	✓		
	Record Check-out	✓		
	Retrieve Attendance	✓		
Manage File to Handle Scheduled Waste(Admin, Manager)	Add file	✓		
	Update file	✓		
	Delete file	✓		
	Retrieve file	✓		

This test has been performed by;

Name: Farra Alia binti Rosli

Signature:

Date: 10 June 2023

## **Chapter 5**

### **Conclusion**

#### **5.1 Conclusion**

In conclusion, during developing the system, few objectives are being focused in order to keep on tracking in smoothen the development of the project. The main objective of this system is to study the Scheduled Waste Inventory and Monitoring system which it allows the employee and manager are able to store the data of scheduled waste without the use of paper and manually. Besides, if the scheduled waste is being stored manually, the employee might fail to remember as there are too many scheduled waste that are being generated. Therefore, with the help of this system it allows the users to easily access and keep track on the scheduled waste disposal date.

By developing a web-based application which is Scheduled Waste Inventory and Monitoring system it is more efficient for the users to keep track on every information. Furthermore, the manager is also able to send the email alert notification to the employee to alert them of the disposal date scheduled waste. In addition, all users need to record their attendance every day and this will allow the manager to monitor their supervisee (employee) since everything will be stored online. This system is being developed by using Visual Studio Code which is used to write the coding and programming process.

The last objective of the system is to evaluate the functionality of the Scheduled Waste Inventory and Monitoring system. User acceptance test are being conducted to test all the functionality in the system to get the user feedback. Eventually the Scheduled Waste Inventory and Monitoring system is being developed successfully. However, there are some constraint and need to be improved.

#### **5.2 Recommendation**

The results of User Acceptance Test (UAT) that was given by the users which is the client of this system, it operates well. This is system manage to store all the information and able to alert the employee. Besides, another feedback is the system is user-friendly and easy to use. During the first time of using the system, they are able to memorized

all the position and functionality of the system and the design of the system is simple and minimalised.

However, there are few suggestions from the client in order to improve this system. First suggestion is to implement a barcode system. For example, after users has fill in all the information regarding the scheduled waste, the system is able to generate a barcode and able to print the barcode. Then, the barcode can be stick on the container of the schedule waste. This will ease the users when they want to retrieve the details about the scheduled waste, they just need to scan the barcode by using mobile phone and retrieve all the details instantly. By incorporating this barcode system, users can streamline the management of scheduled waste, enhance data accessibility, and simplify waste tracking processes. This system is not responsive to mobile as some of the function may not be able to work well in mobile. Nevertheless, to implement the barcode system it is more suitable if the system is also mobile friendly which it can scan the barcode using the camera and instantly retrieve all the details.

Another suggestion is to allow the users record their attendance by using face recognition. By using face recognition, it will ease identify individuals within seconds, eliminating the need for manual check-ins. Furthermore, by using face recognition provides a higher level of security compared to traditional methods like punch cards or check-in using the system, as it is difficult to forge or duplicate someone's face. This helps prevent fraudulent activities such as buddy punching or proxy attendance. However, it is difficult to the face recognition due to lack of knowledge and limited time. Since face recognition systems should be able to handle a diverse user population, including individuals with different skin tones, facial features, and variations due to age, facial hair, or accessories. The system should be robust enough to accurately recognize faces across these diverse characteristics. Therefore, the algorithm used must be difficult and there is limited time to study all the algorithm to create the face recognition attendance record.

In looking towards the future, it is hoped that these recommendations will be taken into consideration for the further enhancement of the system. Whether it is by someone else or by myself, investing time and effort into researching and implementing the barcode system and exploring robust face recognition algorithms would undoubtedly

bring additional value to the system. By continually improving and expanding the system's capabilities, it can better serve the users and meet their evolving needs.

## **APPENDIX A**

Database Design and Flowchart link:

[https://drive.google.com/file/d/11w\\_Jl0lnAd3cDGF8Pi5z\\_6BXqvwYbOmZ/view?usp=sharing](https://drive.google.com/file/d/11w_Jl0lnAd3cDGF8Pi5z_6BXqvwYbOmZ/view?usp=sharing)

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